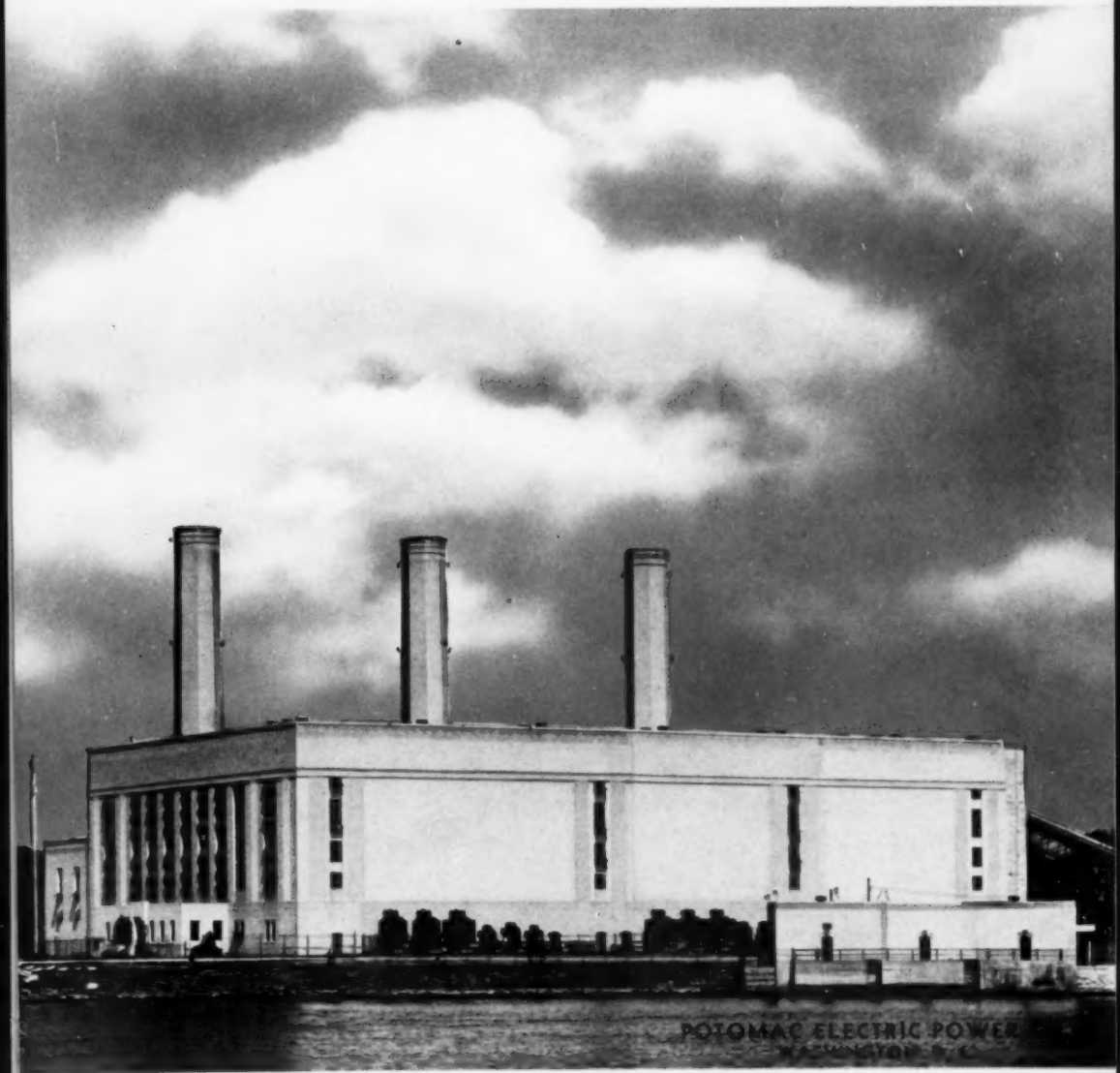
INDUSTRY AND POWER

For Executives and Engineers Responsible For Engineered Plant Services



JUNE 1952

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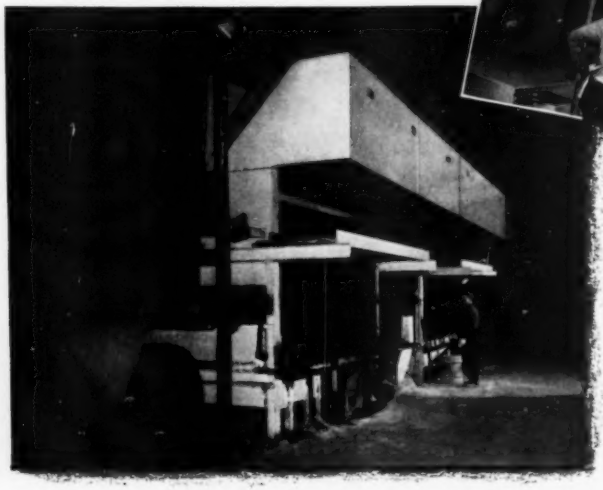
in Erie, Pa. HARTZELL FANS

SOLVED A PRODUCTION PROBLEM

Hartzell can solve your industrial air moving problems just as they did for this Erie, Pa. manufacturer. And do it efficiently and economically with the assurance that the installation specified is *exactly* right for the job expected of it. Perhaps *your* problem is similar to that of this Erie roofing products manufacturer. He was faced with removing noxious fumes from above and around machines used for applying coating to roofing materials (see illustrations). Under certain weather conditions, the plant had to be closed for days. Time and money were lost.

The Hartzell field engineer was called in. He made a careful survey—then specified Hartzell ND36-F-BDS Belt Drive Duct Fans, specially constructed for high temperature service. These fans did the trick. And they are saving this manufacturer money every day of operation.

Hartzell fans and blowers can do the same for you, even in the trickiest of installations. Find out more. Mail the coupon or get in touch with your nearby Hartzell field representative today.



***Above and to the Left:** Two views of the saturators which apply coating to roofing materials. Two Hartzell belt drive duct fans are in use in each illustration.*

The Hartzell field office which handled this job is located at 33 Maple Ave., North Girard, Pa.—Telephone 317.

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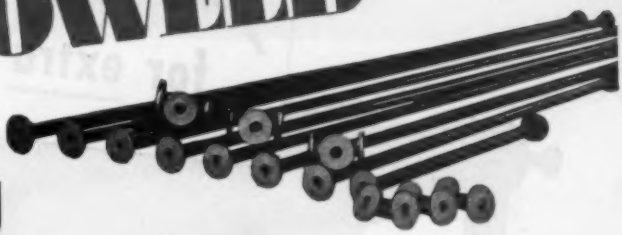

Lined Piping

WHEREVER you handle corrosives, abrasive materials and other enemies of metal piping, it will pay you to investigate the savings you can make with PLIOWELD—Goodyear's lining material that bonds *permanently* to metal surfaces.

7 REASONS WHY
THE G.T.M. SPECIFIES PLIOWELD

1 Effectively seals in corrosives that cannot be handled in metal

2 Bonds permanently to metal surfaces—an exclusive Goodyear process

3 Does not split or loosen with vibration or severe external impacts

4 Does not crack or buckle under alternate wetting and drying or under temperature changes

5 Surface will not disintegrate or slough off—*cannot ever contaminate in-process materials*

6 Protects product from discoloration, iron "pickup" and other contaminants

7 Each installation specially formulated to provide maximum protection against chemical handled

The G.T.M.—Goodyear Technical Man—will gladly discuss your problem—and recommend a PLIOWELD lining matched to your needs that will give you these benefits:

LOWER OVER-ALL COST because the useful life of PLIOWELD lined pipe so far exceeds unlined pipe that its slightly higher initial cost is more than made up by your savings in replacement outlays.

LOWER MAINTENANCE COST. Because PLIOWELD is absolutely impervious to corrosion, daily inspections and frequent maintenance shutdowns are eliminated. *The savings this means should cover the cost of PLIOWELD lining in a short time.*

IMPROVED PRODUCTION where PLIOWELD lined pipes handle production items. Your product is protected against taint and discoloration because the lining won't slough off or contaminate liquids.

Ask the G.T.M. about PLIOWELD lined pipes, fittings and equipment—everything from laboratory equipment to rail tank cars—or write Goodyear, Akron 16, Ohio.

Pliowald—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR

THE GREATEST NAME IN RUBBER

precision built
for extra long life

- Extra rigid, accurately machined crankcase assures permanent alignment.
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- Extra rugged, heavy duty compressor cylinder valves precision built for long, hard service.

From massive crankcase and crankshaft down to the smallest valve spring, *every* component of Clark Balanced/Opposed Air Compressors is machined and finished to infinitely accurate tolerances.

Such unequaled, precision construction — *plus vibrationless operation through perfect balance* — are your assurance of extremely long life with a minimum of maintenance. Clark Balanced/Opposed, Motor-Driven Air Compressors are designed and built to serve *indefinitely!*

For information on this truly modern line of air compressors, covering a range of 150-4500 bhp, request Bulletin 118.

CLARK balanced/opposed compressors

CLARK BROS. CO., INC. • OLEAN, N. Y.

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***Engineered Plant Services**

By ***Engineered Plant Services*** we mean the ***providing*** or ***generating, transmitting, controlling, applying,*** and ***maintaining*** of POWER, STEAM, MECHANICAL DRIVES, HEAT, ELECTRICITY, AIR, WATER, and other engineered services in and for all areas of the industrial establishment as required for production and operation. This includes Lubrication, Piping Systems, Industrial Waste Disposal, Corrosion Control, Electrical Systems, Industrial Heat, Cool and Bulk Handling, Dust and Fume Control, and other related services of an engineering nature.

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Acorns of science

Developments not yet available, but of interest to those responsible for Engineered Plant Services

Aluminum Electrodeposited

• A practical process for electrodepositing aluminum has been developed at the National Bureau of Standards. Dense, ductile deposits, expected to find application for electroforming articles to close inside tolerances, are obtained from a new type of organic plating bath consisting of an ether solution of aluminum chloride and a metal hydride.

Because aluminum is so high above hydrogen in the electromotive series, it has never been obtained from aqueous solutions, which always contain some ionized hydrogen. Standard method of preparing aluminum is the high temperature fused cryolite and aluminum oxide process. Thus, a room temperature bath would be an important contribution. Current densities are limited to 0.02 amp/cm² for thick deposits.

Glycerine in Fluid Mechanics

• Photoviscosity of glycerine is a property useful in research in fluid mechanics as reported by the Glycerine Information Service. When model constructions are set up in transparent pipes containing obstructions and glycerine is used as the flowing liquid, lines of the flow pattern are clearly visible.

Ozone Resistant Rubber

• Pilot plant quantities of a new rubber-like material are being produced by E. I. DuPont de Nemours and Co., Inc. Although it has many excellent qualities associated with rubber (many are better), the most interesting characteristic is its complete resistance to ozone, responsible for deterioration of natural and many synthetic rubbers.

One useful application is in coating sponge and solid rubber sections such as used in weatherstripping and other gaskets to prevent deterioration. Electrical properties may not be good enough for use as a primary, high voltage insulator, but may be adequate for low voltage applications. Single extrusion processes may replace costly double extrusions on outdoor wires.

More New Papers

• Three new papers made from unusual materials were developed at the Naval Research Laboratory. One is quartz paper, whose manufacture closely resembles conventional paper making, and withstands 3000 F. Also, it contains no boron, may be used for insulation subject to atomic radiation. Another, a ceramic paper, is made conventionally from aluminum silicate, will withstand 2500 F. The third type is made from plastic fibers sprayed onto a fine metal screen and then removed, eliminating critical paper making or textile machinery. It has higher dielectric strength than glass, stands 250 F, is water repellent.

Thermoelectric Balance

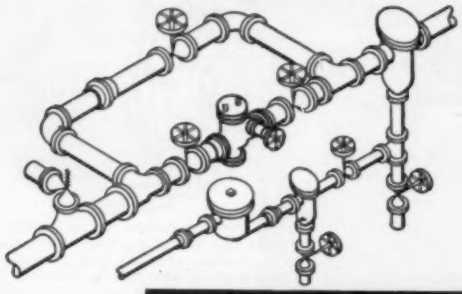
• Patent No. 2,588,564 discloses an electrical resistance network so arranged as to overcome the adverse effects of thermoelectric currents resulting from the juncture of different metals and changes in the ambient temperature of the system and the connections therein.

Fluid Flow Control

• Patent No. 2,586,984 describes an apparatus to provide a non-fractionating capillary leak. It comprises a length of metal tubing, a cylindrical element to provide an annular, reduced cross-section, conducting passage in the tube, and adjustable gripping means for equally increasing or decreasing all portions of the passage.

Can Your Pressure Regulators Match This Service Record?

...on a Steam Kettle for instance



THE INSTALLATION

On steam supply line to cooking kettle, Schoenling Brewing Company, Cincinnati.

THE HISTORY

Specifications for this installation called for a regulator to reduce main line steam supply at 100 psi to 30 psi, and automatically maintain the reduced pressure to cooker, 24 hours daily, without significant fluctuation.

A Crane Pressure Regulator with factory pre-set range was selected and properly installed with adequate, automatic drainage of the steam lines.

For 16 years, throughout its lifetime, the Crane Pressure Regulator did its job to the brewery's complete satisfaction. Never was it out of service; never did it require more than the simple prescribed periodic inspection. (Note: current model has renewable wearing parts; will virtually never wear out.)

VALVE SERVICE RATINGS

SERVICE LIFE:	16 years - 24 hours per day
MAINTENANCE COST:	None - simple servicing only
SPECIAL FEATURES:	Good pressure range - easy adjustment
SUITABILITY:	Steady flow - no pressure build-up
OPERATING RESULTS:	Accurate control of cooking process
PRICE:	Low - considering service life
AVAILABILITY:	Stock item - Crane line

THE VALVE

Crane No. 960 Brass Pressure Regulators are made for reducing steam or air pressures up to 250 pounds, to within 80% of inlet pressure. They are factory pre-set to operate within any of 4 ranges from 1 to 200 pounds, with easily selected outlet pressure within set range. Precision made, they are fully automatic, highly dependable, even under reasonable fluctuation of inlet pressure. All wearing parts renewable. See your Crane Catalog or Crane Representative for complete data.

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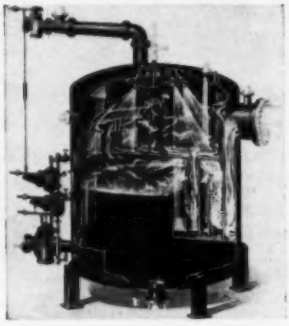
New equipment and developments

Highlights of new products by leading manufacturers

Each new product item has a key number for your convenience in asking for additional, detailed information. Insert key number on return post card on page 135

1—Deaerator has internal vent condenser

An internal, direct contact vent condenser has been incorporated in a deaerator developed by The Permutit Co. Elimination of vent condenser bypass piping is said to reduce installation costs and save head room. Reduction of



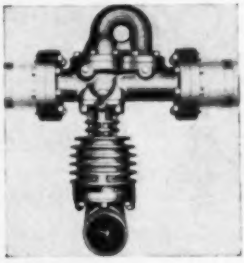
maintenance costs, by eliminating need for cleaning or replacing tubes of the usual tubular vent condenser, is also claimed. Water is heated and deaerated in three stages. Primarily these consist of vent condenser, spray compartment and reboiler steam scrubbing stages.

2—Instruments indicate mercury vapor in air

Two redesigned portable mercury-vapor detectors, electronic Type A and chemical Type B, have been announced by General Electric's Special Products Div. The units are used in industry to indicate mercury vapor concentrations which could be harmful to workers. Lighter weight, compact design and increased sensitivity are listed among advantages. The electronic instrument shown below gives instantaneous readings from 0.01 to 3.0 mg of mercury per cu cm of air. The chemical unit, for continuous monitoring, will indicate as little as 0.10 mg of mercury per cu cm of air in two hours.

3—Flow meter features improvements

Redesign of the Model SMKS Shuntflow meter for steam, air or gas has been announced by Builders-Providence, Inc. Improvements include more uniform cooling system, greater strength and durability, increased efficiency, easier parts replacement, and ability to withstand slugs of undue condensate or sudden fluctuations in line pressure. The units are used for heating and process work.

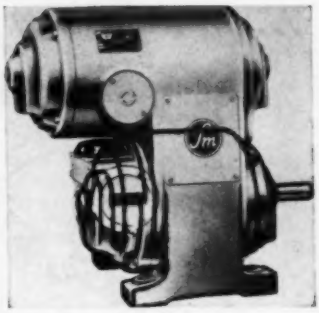


4—Regulating valves feature wide rangeability

Double seated diaphragm regulating valves, Class DV, have been developed by Leslie Co. for use with control instruments. In addition to having many special features, they are said to provide wide rangeability and accurate control. Sizes range from 1¼ to 10 in. for pressures to 600 psi.

5—Variable speed drive is interchangeable

Mounting dimensions interchangeable with NEMA standard motors are featured in a variable sp ed drive announced by Sterling Electric Motors, Inc. The unit consists of a variable speed transmission and induction motor built into a single compact unit. Drip-proof, splash-proof and totally enclosed designs are available with speed variations of 2:1, 3:1 or 4:1 in sizes from 1 to 3 hp for single phase and 1 to 15 hp for polyphase.



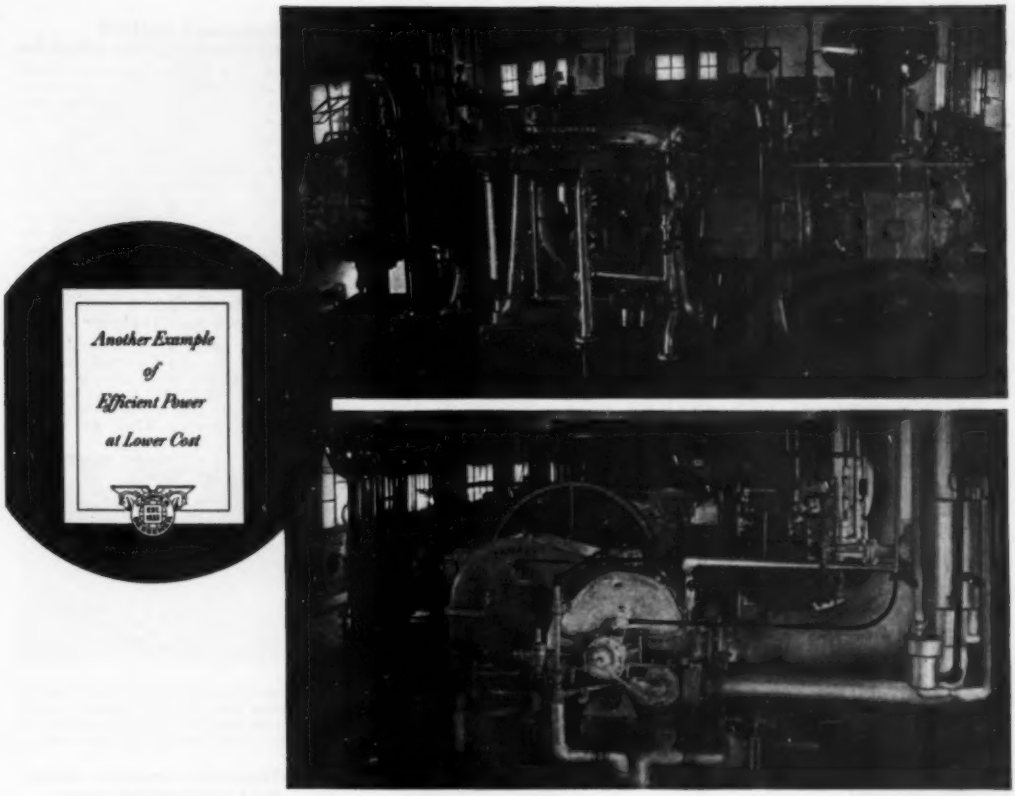
6—Combination burner permits instantaneous change-over

Thermobloc Div. of Prat-Daniel Corp. has announced a combination oil-gas burner for use with their industrial type forced warm air direct-fired heaters. The burner permits instantaneous change-over, either automatically or with manual pushbutton.

7—Cooler is built in two sections

Dravo Corp. has announced a 3 hp. split-type crane cab cooler, the C-3SP, designed to maintain a temperature of 80 to 85 F within a cab when surrounding ambient temperatures reach 130 F. The unit is equipped with electric strip heaters for winter, dust and dirt filters and activated carbon canisters for fume and odor removal. Operation is fully automatic. The condenser section may be located anywhere on the crane.

(Continued on page 10)



In Processing Service . . .

COOPER-BESSEMER MOTOR OR TURBINE DRIVEN COMPRESSORS

. . . for continuous operation . . . for minimum down time

● The units shown above are Cooper-Bessemer M-Line compressors in Continental Oil Company's Billings Refinery. They are turbine driven, with reduction gears, and are handling vapor and recompressor gas through 2 stages, from 17 psi to 253 psi discharge.

During their two years of continuous operation, these units have shown a typical M-Line record — smooth, trouble-free performance, minimum down time and completely satisfactory behavior in general. The reasons are simple. Combined in these units are many of the features that have contributed to the success of Cooper-Bessemer engine-driven horizontals and modern V-Angles — features that come only from years of practical experience and painstaking development work in compressor design and construction.

If you have new jobs coming up requiring either motor or turbine driven compressors get all the facts on modern Cooper-Bessemers. They are available in sizes from 250 to 5,000 horsepower.

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Cooper-Bessemer
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Seattle, Wash. Shreveport, La. St. Louis, Mo. Los Angeles, Calif.
Caracas, Venezuela Gloucester, Mass. Tulsa, Okla. New Orleans, La.

New equipment and developments

(Continued from page 8)

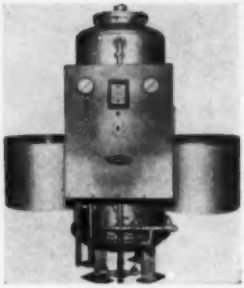
8—Clutch eliminates stalls during starting

An automatic centrifugal clutch for use wherever high starting torque exists has been developed by the Clutch Div. of Elgin Sweeper Co. It may be installed in conjunction with either gasoline engine or electric motor. Load is picked up automatically and smoothly after the driver has reached normal speed. Stalls and slowdowns occurring below normal operating speeds

due to overload are eliminated. The unit automatically disengages when speed is reduced for idling. Standard units for ½ to 25 hp are available.

9—Demineralizer operates automatically

Automatic operation is featured in a Mono-Bed demineralizing unit developed by Penfield Manufacturing Co., Inc. A single tank having a mixed bed of cation and strong anion resins is used. When the effluent's conductivity falls below standard, the treated water is automatically discharged and a warning system is activated. Turning a single switch then puts the unit through the regeneration cycle auto-



matically and refills regenerative tanks ready for the addition of fresh acid and caustics. Additional information is given in recently published catalog.

TO REQUEST ADDITIONAL FREE DATA
Insert "key" numbers on return post card found on page 135. Our Reader's Service Department will handle your request promptly

11—Molded sheaves claim many advantages

V-belt sheaves molded from Compolene, a fibrous material, are being produced by W. C. Products, Inc. In addition to being unaffected by moisture, oil or temperature, they are said to wear better, weigh less and operate

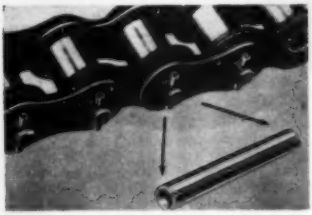
quieter than metal pulleys. Sizes from 2 to 6 in. OD are available, with or without keyways, and with bore sizes of ⅜, ⅝ and ¾ in.

12—Instrument controls time-temperature schedules

Control of time-temperature schedules for industrial processes is accomplished by an electronically operated circular chart controller developed by Minneapolis-Honeywell's Brown Instruments Div. An integral program cam mechanism automatically positions instrument control point in accordance with a predetermined program. The unit combines measurement and recording, automatic positioning of the set point index and automatic program control of the variable.

13—Roller chains feature new fastener

Rollpins, said to be more durable than the cotter pins they replace, have been adapted for most of the larger pitch roller chains manufactured by Morse Chain Co., division of Borg-Warner Industries. They are cham-



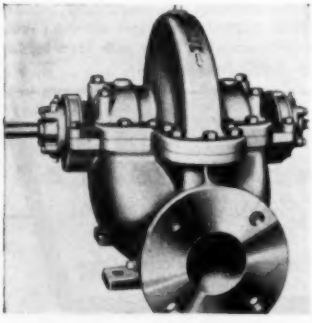
fered-end, slotted steel cylinders which compress into pin holes smaller than their own diameter, expand and lock into place until deliberately removed.

14—Separator recovers excess heat from reflash steam

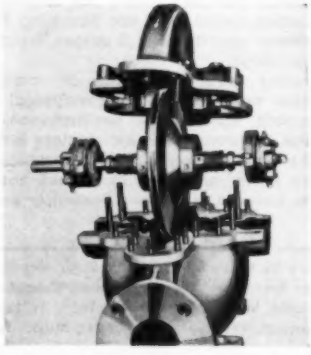
Reflash steam separators have been developed by Strong, Carlisle & Hammond Co. for plants having large amounts of high pressure condensate or continuous blowdown. Recovery of excess heat from reflash steam is accomplished by using the separator, connected to discharge of high pressure steam traps, in conjunction with low pressure heating or process systems.

(Continued on page 14)

10—General purpose pump has mechanical shaft seal



Standard mechanical shaft seals are used instead of conventional stuffing boxes in a horizontal, split-case, general service pump announced by Peerless Pump Div. of Food Machinery and Chemical Corp. The shorter shaft permitted by this type of design results in smoother, quieter operation and longer life for bearings, seals and wearing surfaces, according to the manufacturer. Other advantages claimed include savings in floor space, easier servicing, and elimination of leakage along the pump shaft. The units, Type AS, are available in discharge sizes from 1½ through 4 in. Capacities are to 750 gpm and range of head is to 230 ft. General application is for water and clear liquids up to 200 F. Details of construction are presented in 8-page bulletin.



Photomicrograph of one type of silica scale in early formation stage. Further deposits will fill in between the "trees" to form a dense, glass-hard, insulating covering that is extremely difficult to remove—and impervious to usual water treatment techniques.

STONE FOREST

(The boiler scale that fought back)

● When silica scale was mentioned, water-treatment experts used to change the subject quickly . . . until a plant using The Nalco System began having scaling troubles due to high silica content of the raw water.

That was many years ago. Today, the same plant, operating at 135 psi, maintains 500 ppm (29.4 grains per gallon) silica in boiler water without scaling.

The Nalco research program that solved this low-pressure boiler water silica problem is a continuous one, so that today The Nalco System successfully meets the challenge of silica wherever it arises in the field of water conditioning.

Whether your water treatment problem is silica—or something even tougher—Nalco has the solution, or can put the full facilities of the Nalco Laboratories to work on it for you.

LATEST STUDY ON SILICA CARRY-OVER

At operating pressures over 400 psi another silica problem—that of silica carry-over—often arises. One of the 1951 ASME papers, "Correlation of Silica Carry-over and Solubility Studies" is an up-to-the-minute, informative discussion of this problem. You are welcome to a copy. Just write to National Aluminate Corporation.

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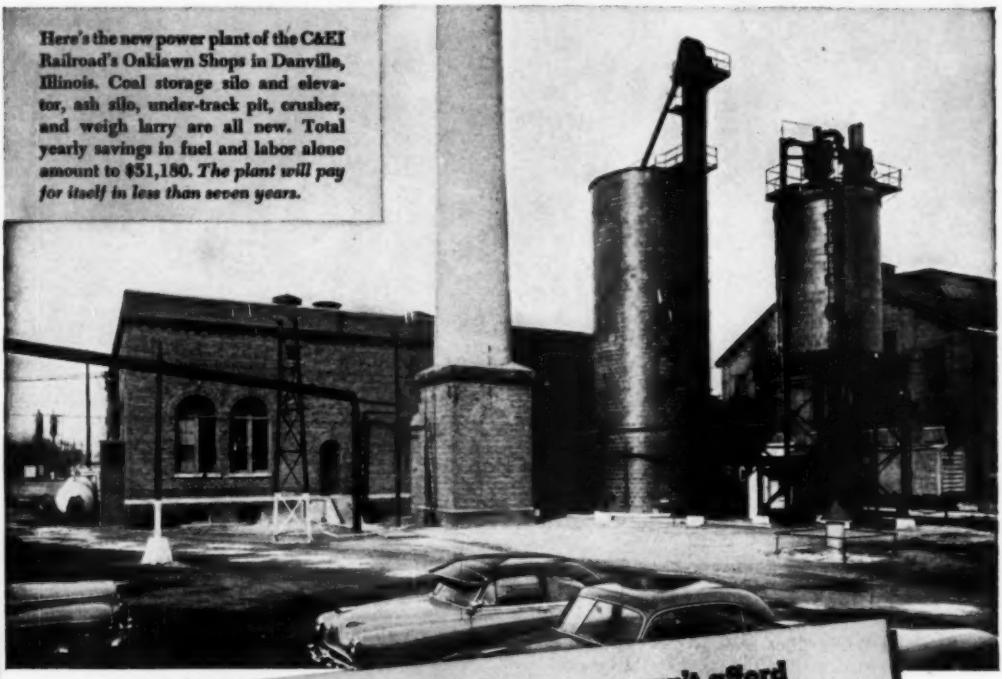
THE *Nalco*® SYSTEM . . . Serving Industry through Practical Applied Science

"BURNING COAL THE MODERN WAY CUT OUR POWER COSTS



Here's the new power plant of the C&EI Railroad's Oaklawn Shops in Danville, Illinois. Coal storage silo and elevator, ash silo, under-track pit, crusher, and weigh larry are all new. Total yearly savings in fuel and labor alone amount to $51,180. *The plant will pay for itself in less than seven years.*

If you operate a steam plant, you can't afford to ignore these facts!

COAL in most places is today's lowest-cost fuel.

COAL resources in America are adequate for all needs—for hundreds of years to come.

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

FOR HIGH EFFICIENCY
FOR LOW COST

$51,000 A YEAR!

UP-TO-DATE COAL INSTALLATION CUT FUEL CONSUMPTION 20.3% . . . LABOR FORCE 47%!"

says Mr. George E. Bennett, Supt. Motive Power, Chicago & Eastern Illinois Railroad.

"We recently modernized the power plant at our Oaklawn Shops in Danville, Illinois. Three boilers now do the work that formerly required seven. We've realized great savings in labor and fuel. It's proved to us that, when it comes to both economy and efficiency, you just can't beat *bituminous* coal burned with modern equipment."

This is a view of the firing aisle showing the spreader stokers which are fed by a weigh larry. Man-days per week required to operate the plant have been reduced from 112 to 59! The three new boilers were installed one at a time as the old units were removed, thus not interrupting the operation of the shop.

● Low cost—high dependability—easy, safe storage—coal gives you all these big advantages no matter how you burn it.

But you can get much more!

Cut labor costs to a minimum—handle coal and ashes with automatic equipment . . . burn coal in a *modern* combustion installation—you'll get more BTU's, more steam for every dollar spent.

If you're planning to modernize, or if you're building a new plant, call in a consulting engineer. He'll show you how modern coal equipment, designed to meet your specific needs, can effect a sharp reduction in your operating costs.

And remember, with coal you have a future dependability no other fuel can offer. America's coal reserves assure an abundant fuel supply far beyond the productive lifetime of your plant. And to mine this coal, America has a highly mechanized, progressive coal industry. Few American industries of any type can match the productivity and increasing efficiency of this nation's coal-mining companies. You can count on coal's economy, on coal's dependable supply—right now and for the future, too!

BITUMINOUS COAL INSTITUTE
A DEPARTMENT OF NATIONAL COAL ASSOCIATION
WASHINGTON, D. C.

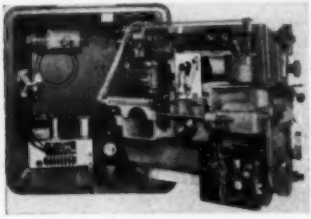
YOU CAN COUNT ON COAL!

New equipment and developments

(Continued from page 10)

15—Conversion unit for mechanical pyrometers

Conversion of mechanical pyrometers to electronic units can be accomplished at low cost with a kit announced by Pyrometer Service Co. All necessary parts for complete conversion of most well-known chart record-



ers and indicators are included. Installation is said to be simple and does not require experience.

16—Blender features improved design

The Twin-Shell blender recently developed by Patterson-Kelley Co., Inc. as a mixer for processing industries, is offered with a newly designed rotating "intensifier bar." The lug studded bar is said to improve mixing action by effec-

tively breaking up lumps, dispersing materials tending to agglomerate and homogenizing liquids into solid mixes. Descriptive literature is available.

17—Instrument tests water hardness

Refinite Corp. has announced development of an instrument, the Hydramizer, used to signal the end of a zeolite softener run. The unit tests water samples by soap test method. Lights indicate test results. It may be applied to actuate valves of automatic softeners, or to actuate a signal when used with selective-automatic or manual units. Compact size permits placement on a stand or shelf near the softener. Due to simple construction, little maintenance is said to be required.

18—Volt-ammeter is clamp-type

Both voltage and amperage can be measured quickly with accuracy within plus or minus 3 per cent of full scale

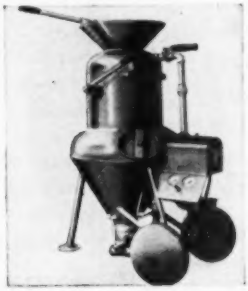
deflection with the Type AC-1 clamp-type volt-ammeter developed by Columbia Electric Mfg. Co. Readings are made without breaking the circuit. Jaws accommodate cable to 1½ in. diam and bus bars to 2 x ½ in. Ranges available include 0-150 and 0-600 v a-c, and 0-12, 0-60, 0-120 and 0-600 amp a-c. Descriptive literature is available.

TO REQUEST ADDITIONAL FREE DATA

Insert "key" numbers on return post card found on page 135. Our Reader's Service Department will handle your request promptly

19—Cement gun handles variety of materials

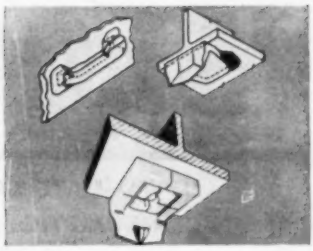
Air placement of a wide variety of materials including cement, sand, light weight aggregates and refractories is possible with the Blastcrete machine, developed by Blastcrete Equipment Co. Outstanding feature is said to be the wide range of controls the operator has at his disposal over



factors of material, volume and air pressure. Applications are listed in 4-page bulletin.

20—Welding connector allows adjustment

J. H. Williams & Co. has developed an adjustable clip, the K3A, to be used with the Saxe welded erection system for assembling structural steel. The



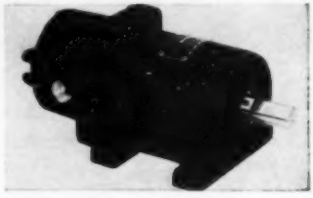
clip, which allows up to ¼ in. adjustment, is said to facilitate erection. A bulletin giving details is offered.

21—Radiant heating ovens are completely integrated

Radiant heating ovens for industrial baking and drying at temperatures of 650 F or less have been developed by Jensen Specialties, Inc. The units, which utilize 2000 w General Electric Calrod heaters, are manufactured in a complete panel, including tubular heating elements, reflectors, and insulation, with plug-in receptacle and pantograph mounting. Interchangeable heater panels allow construction of units to specification. Greater concentration of heat per unit area is said to result in increased capacity per kw hr.

22—Tachometer heads are for heavy duty

Heavy duty tachometer heads, Series 56M, for measuring a wide range of speeds are being manufactured by Metron Instrument Co. They are well suited for use with tachometer indicators, recorders or controls which



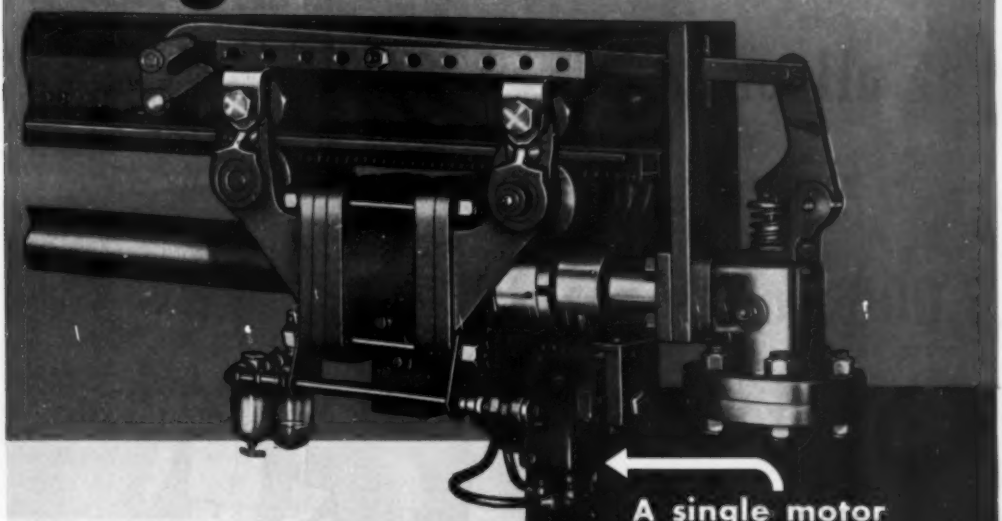
measure speeds of cement kilns, ball mills, metal working machines, rubber extruders, and similar installations where ruggedness and long life without maintenance are important. Speeds between 200 and 10,000 RPM for full scale indication are measured. Units can be overspeeded 2 to 10 times without damage.

23—Conveyer belting is vegetable oil resistant

Baldwin Belting Inc. announces an improved neoprene is now incorporated in Baldwin white Supertex conveyer belting. The improved material, Type WRT, was developed to resist vegetable oils. It is washable, oilproof, waterproof, tasteless, odorless, nontoxic and resistant to acid, alkali and heat.

(Continued on page 18)

Single Motor Drive



A single motor
(air or electric)
both rotates and propels
the long lance tube

Another important advantage of DIAMOND Model IK Long Retracting Blowers

A single motor, simultaneously propelling the carriage and rotating the lance tube through a rugged system of gears, represents the ultimate in simplicity and reliability. There is only one set of motor elements, one set of control elements, and one set of power supply facilities to operate and to maintain. This feature of the Model IK Blower is an excellent example of the Diamond policy of simplification that means more dependable operation and lower maintenance costs.

Another feature of the Model IK that has the enthusiastic approval of users is the mechanically operated valve. Opening and closing of the valve is positive, dependable and accurate . . . all essential to correct performance. Here again note the simplicity of the mechanism.

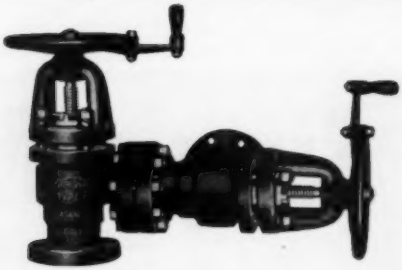
For further information, ask for a copy of Bulletin 1055X.

DIAMOND POWER SPECIALTY CORP.
LANCASTER, OHIO
Diamond Specialty Limited, Windsor, Ontario

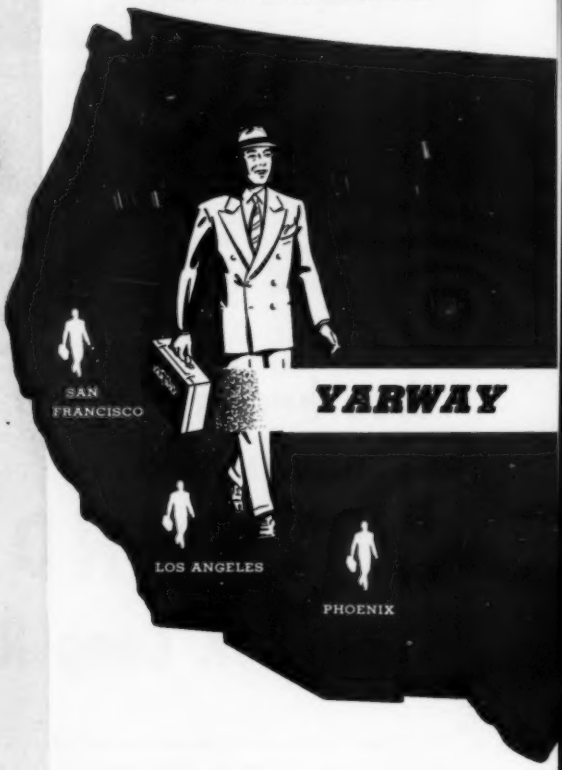
blow-down lines at all pressures in more than 15,000 boiler plants from coast-to-coast are kept tight by

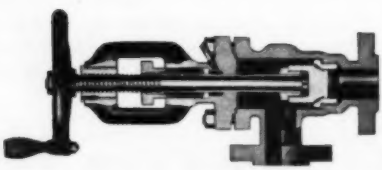
YARWAY

Blow-Off Valves



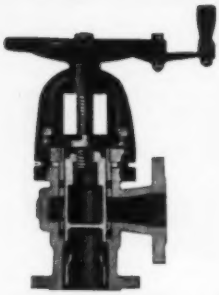
Type B Seatless Tandem Valve combining two angle valves. Iron body for pressures to 250 psi. Steel body for pressures to 400 psi. See Yarway Bulletin B-425.



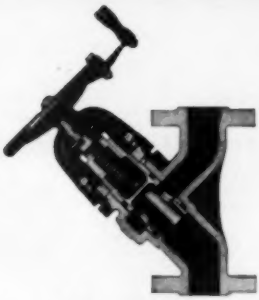


Hard Seat Blow-Off Valve (angle) cone-seat and disc type, with mated stellite seat and disc. Made for pressures up to 2500 psi, flanged or welding ends. See Bulletin B-433.

YARNALL-WARING COMPANY
109 Mermaid Avenue, Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES



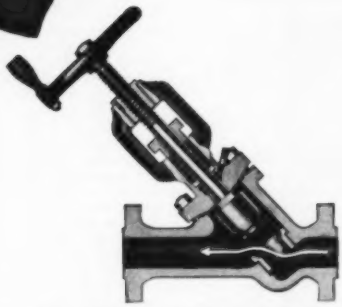
Seatless Blow-Off Valve (angle) with no seat to score, wear, clog or leak. Type B (shown) for pressures to 400 psi, see Yarway Bulletin B-425; Type C for pressures to 1500 psi, see Bulletin B-433.



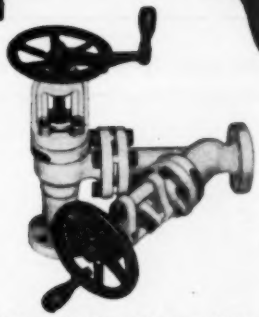
Seatless Blow-Off Valve (straightway) sectioned to show balanced sliding plunger in open position. Type B (shown) for pressures to 400 psi, see Bulletin B-425; Type C Seatless Valves for higher pressures, see Bulletin B-433.

Type C Seatless Tandem Blow-Off Valve combining angle and straightway valves. Angle-angle and straightway-straightway combinations also available. Pressures to 600 psi, see Bulletin B-433.

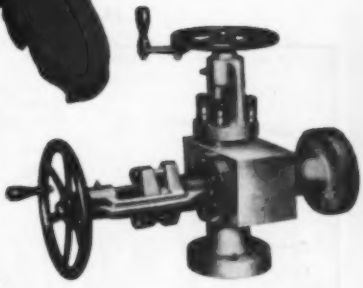
SERVICE GOES ALL THE WAY . . .



Hard Seat Blow-Off Valve (straightway) sectioned to show mated stellite seat and disc in open position. For pressures to 2500 psi. See Bulletin B-433.



Hard-Seat—Seatless Tandem Valve. Hard seat is the blowing valve; seatless is the sealing valve. Available in any combination of angle or straightway bodies, flanged or welding ends. For pressures to 1500 psi. Hard seat—Hard seat Tandems for pressures to 2500 psi. See Bulletin B-433.



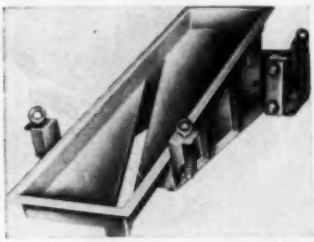
Unit Tandem Blow-Off Valve, combining hard-seat blowing and seatless sealing valve in one-piece forged steel body for pressures to 1500 psi. Two hard-seat valves in tandem also available for pressures to 2500 psi. See Bulletin B-433.

New equipment and developments

(Continued from page 14)

24—Feeder provides continuous curtain of materials

Syntron Co. announces a vibrating spreader feeder for providing a continuous curtain of such bulk materials as roofing granules and calcium chloride. The unit employs a flat pan trough having a diagonal slot and powered by



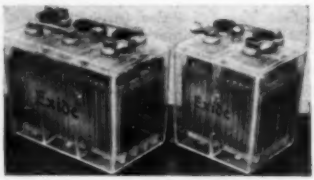
a single electromagnet drive. Rate of feed is controllable. Applications are listed in 16-page bulletin.

25—Switches are for cam actuated service

Snap-action switches designed for precision performance in rugged, cam actuated service have been announced by Micro Switch, a division of Minneapolis-Honeywell Regulator Co. A roller plunger actuator adapts operation to cams with a rise up to 30 degrees. The plunger can be turned to any position for aligning the roller with direction of cam approach. Ratings of single-pole, double-throw switches for a-c operation are: ¾ hp at 115 v; 1½ hp at 230 v; 20 amp at 125, 250 or 460 v; and 10 amp at 125 v suitable for controlling tungsten filament lamp loads. D-c ratings are ½ amp at 125 v; ¼ amp at 250 v.

27—Batteries have plastic case

Storage batteries of 2 and 3 cell construction for such stationary applications as electric switchgears, communications and emergency lighting and power, have been announced by The Electric Storage Battery Co. Designated Exide Type PLX, they feature compact size, lighter weight, reduced maintenance and improved dependabil-



ity. The case is transparent polystyrene. Built-in floats indicate approximate charge. Illustrated literature is available.

TO REQUEST ADDITIONAL FREE DATA

Insert "key" numbers on return post card found on page 135. Our Reader's Service Department will handle your request promptly

28—Unit crushes reclaimed fused welding flux

Robert Holmes & Brothers, Inc. have designed a crusher, Model 2C, for reclaimed fused flux produced by automatic submerged arc welding. The unit removes tramp iron and returns fused flux to its original size. Construction details are given in 4-page bulletin.

29—Knife blade fuses have cooling fins

Heat dissipating fins have been added to several sizes of renewable knife blade type fuses manufactured by Monarch Fuse Co., Ltd. The interior of the fuse remains cooler, resulting in greater dependability. By keeping heat away from the fibre bar, internal strength is also maintained for accu-

rate alignment. The new design has been incorporated in the 250 v, 600 amp and 600 v, 400 and 600 amp sizes. The new design is described in a bulletin.

30—Thermometer can be adjusted for angle

Time spent in selecting precise angles required for thermometer installations is saved by the use of Adjust-Angle thermometer, according to the manufacturer, Weksler Thermometer Co. Adjustments in any direction through a 180 degree arc can be made for greater visibility.

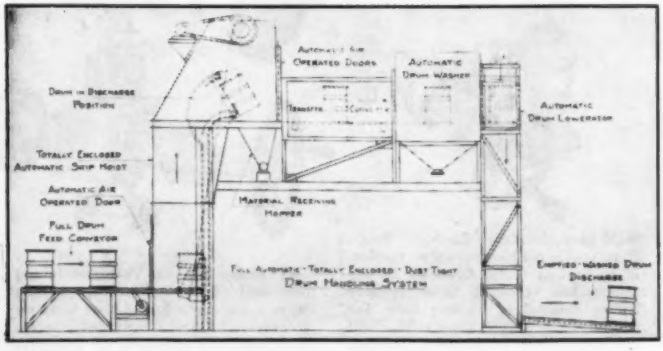
31—Winding tester features sensitivity

Detection of a single shorted turn of No. 40 AWG wire is said to be possible with a portable electronic winding

tester developed by Columbia Technical Corp. The unit consists of a power supply unit, vacuum tube oscillator, regulator and rectifier circuit, and meter. It is designed to detect faults and prevent breakdowns of all sizes and types of motors and generators, coils, and similar equipment.

(Continued on page 24)

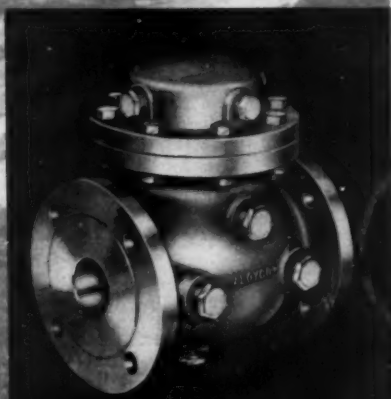
26—Enclosed conveyer system empties drums automatically



Gifford-Wood Co. has announced the development of an automatic, totally-enclosed conveyer system for emptying up to 40 drums per hour. The system eliminates manual lifting, reduces work-hours, provides dust-free emptying and washes emptied drums. It comprises four principal units: an automatic skip hoist; transfer conveyer; automatic drum washer; and lowerator. In operation, the hoist elevates and upends the drum, emptying contents into a receiving hopper. Next it passes to an electrically vibrated grating which dislodges any remaining material. The washer then cleans the drum both inside and out, rinses it and blows it dry. The last operation automatically lowers drum to discharge conveyer. Automatic air-operated doors are used to seal off each operation.

Lasts longer in corrosive service

Like all ALOYCO valves, this jacketed globe check valve is especially engineered for severe corrosive service. Its dependable performance results from extensive metallurgical research and production of high alloy valves exclusively.



ALOYCO No. 1505 Jacketed Check Valve has a cast-in heating chamber or jacket on both body and cap which enables all parts to be uniformly heated.

CALCO standardizes on ALOYCO valves for handling sulfuric acid

THE CORROSIVE: 93% and 98% sulfuric acid, 96% mixed sulfuric acid, oleum.

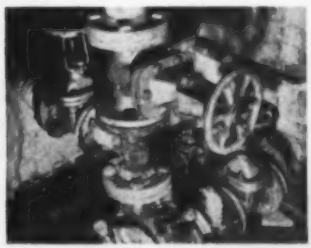
THE APPLICATION: Handling of sulfuric acid for manufacture from ilmenite ore of titanium dioxide, used as an additive to paints, rubber, paper, plastics.

THE PLACE: American Cyanamid Company, Calco Chemical Division, Gloucester City, N. J.

THE VALVES: ALOYCO 20 No. 111-A gate valves, flanged; No. 571 swing check valves, flanged; both Teflon packed.

THE RESULT: Former steel valves leaked at packing glands, causing corrosion of steel stem, stuck frequently in open or closed position. They lasted only a matter of months. Calco has now standardized on ALOYCO 20 valves for handling strong acid throughout the plant. Their service life is now five or six times as long as valves formerly used.

THE BACKGROUND: ALOYCO concentrates on valves for such severe corrosive service. Our foundry practices, our machines and our tools are designed for the production of high alloys alone.



ALOYCO 20 valves are used in three sulfuric acid handling areas: (1) Acid pumped from barges into main outside storage tanks; (2) Outside pump house pumps acid to smaller storage tanks inside main building; (3) Main inside pumps distribute acid to various reactors.

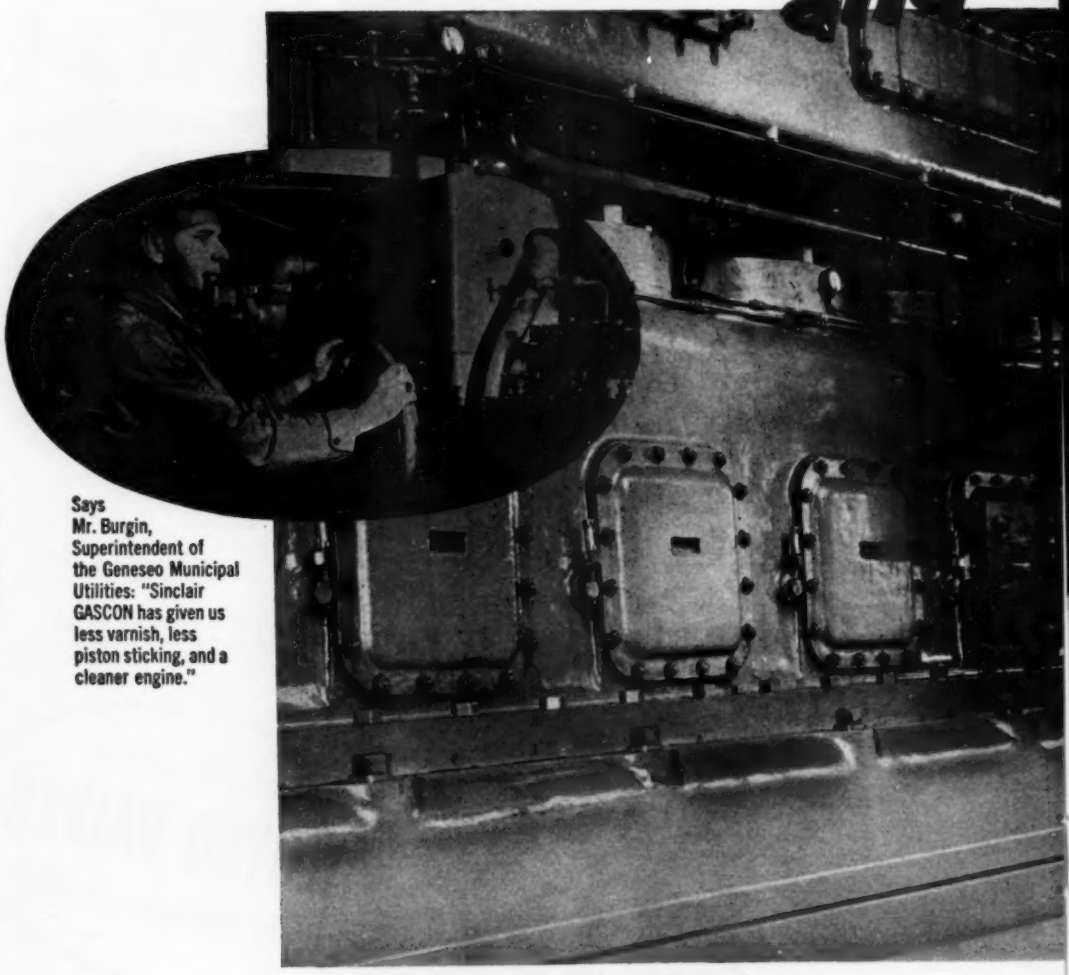
Our *Aloyco Department of Corrosion Analysis* specializes on problems of corrosion, contamination, discoloration, high and low temperature service.

If you have such problems in your plant, perhaps you too can profitably standardize on ALOYCO valves. Just ask ALOYCO.

ALLOY STEEL PRODUCTS CO., INC.
1301 West Elizabeth Avenue, Linden, N. J.

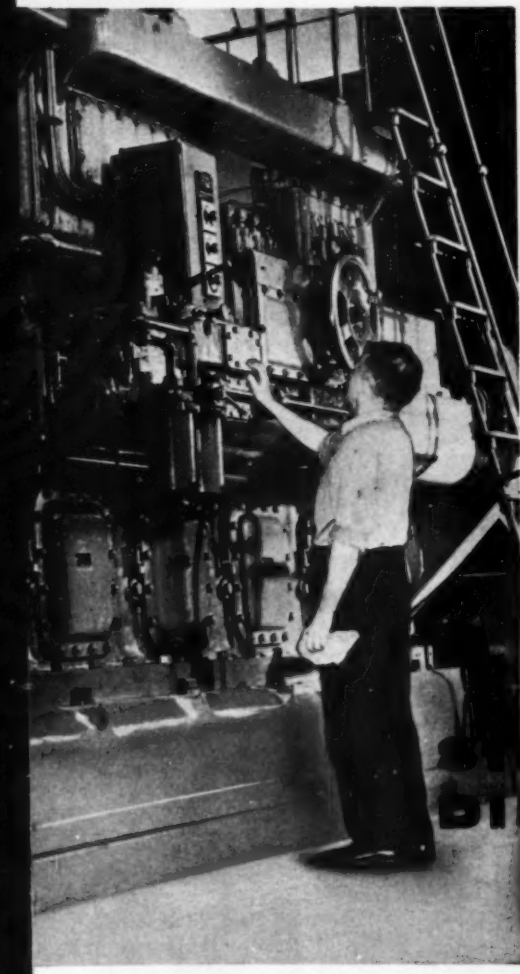
Longer Lasting
ALOYCO VALVES
1st in Corrosive Service

Light Plant Solves of Sticking and



Says Mr. Burgin, Superintendent of the Geneseo Municipal Utilities: "Sinclair GASCON has given us less varnish, less piston sticking, and a cleaner engine."

Problems Rings Carbon Build-Up!



For quite some time the Light Plant of Geneseo Municipal Utilities, Geneseo, Ill., had trouble with sticking rings, and with carbon deposits in the exhaust ports of its diesels. A few years ago these diesels were changed over to Sinclair GASCON D. Almost at once, it was noted that the troublesome conditions started to clear up. In the time since, sticking rings have become the rare exception and the carbon deposits are no longer a problem.

Furthermore, in 1947, a 1400 hp. Fairbanks-Morse engine, shown at left, was installed and filled with GASCON D. This engine has never had a sticking ring and is running remarkably clean, with exceptionally low cylinder wear.

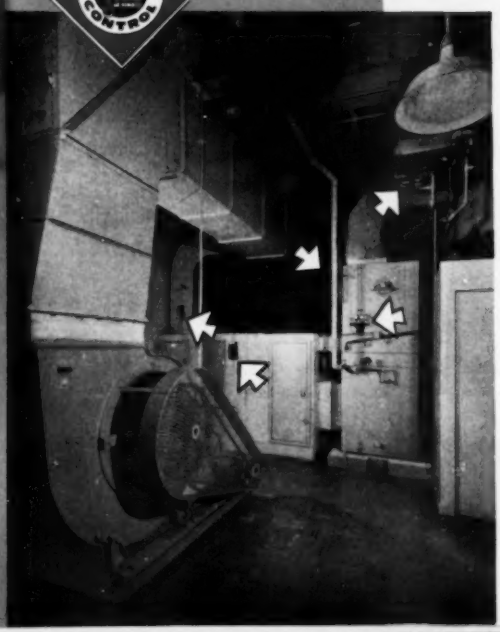
Perhaps GASCON® Oil can cure *your* diesel troubles, too. Get in touch with your nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Ave., New York 20, N. Y.

SINCLAIR DIESEL OILS

prolong engine life

POWERS for Heating and

PNEUMATIC CONTROL SYSTEMS



POWERS Design for MODERN CONTROL PANEL

In the unique functional design of this Control Panel are integrated various types of POWERS pneumatic controlling, indicating and recording instruments. It masterminds the operation of four complete year round air conditioning systems in the modern plant shown on the next page.

Photos at left and top and bottom of next page show air conditioning systems regulated by the Control Panel. Arrows indicate Powers controls.

Photo below, left—shows four refrigerator compressors, one for each air conditioning system; photo right—Powers air compressor and pilot valves supplying air pressure for control system.

Air Conditioning

Pull Heating Costs Down As Fuel Prices Rise

Room Thermostat for Offices

POWERS TEMPERATURE and HUMIDITY CONTROL SYSTEMS prevent OVER-heated air in offices, factories, process rooms and other spaces. Comfortable, healthful room temperature—not only increases output of workers, but—

★ **Cuts Heating Costs up to 25%**—Keeping each room at its proper temperature prevents waste of fuel from OVER-heating. With todays much higher fuel costs, bigger savings than ever before are now possible with Powers control.

Constant Temperature and Humidity conditions in each room can be maintained at any predetermined point with Powers control. It can be installed in existing as well as new buildings.

25 to 40 Years of Dependable Service with very low maintenance cost is reported by hundreds of users. Powers control is notable for its continuous accurate performance.

Precision Control for Processes—Wherever product uniformity and quality are dependent upon precise temperature and humidity regulation, use Powers controlling, indicating or recording instruments.

New modern plant commemorating 60th anniversary of The Powers Regulator Co., pioneer in pneumatic operated controls for heating, air conditioning systems and industrial processes.

Phone or write our nearest office for help in selecting the type of automatic control that will give best results for your requirements. There's no obligation.

THE POWERS REGULATOR CO.

Established 1891 • SKOKIE, ILLINOIS • Offices in Over 50 Cities

CHICAGO 13, ILL., 3819 N. Ashland Ave. • NEW YORK 17, N. Y., 231 E. 46 St.
LOS ANGELES 5, CAL., 1808 W. 8th St. • BOSTON 15, MASS., 125 St. Botolph St.
DETROIT 1, MICH., 2631 Woodward Ave. • TORONTO, ONT., 195 Spadina Ave.
PHILADELPHIA 32, PA., 2240 N. Broad St.

(a10a)

POWERS

Above: Arrows indicate some of the many controls applied to air conditioning system: Powers Duct Hygrostat, Duct Thermostat, Pneumatic Switch, Diaphragm Valves and Damper Motors, Static Pressure Regulators, etc.

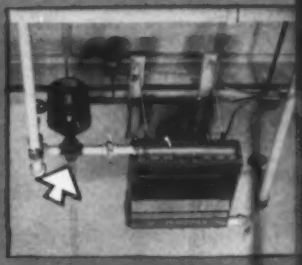
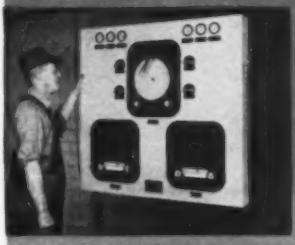
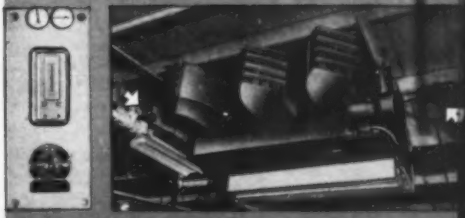


Photo at right shows ceiling type unit heater used in factory. It is controlled by wall type thermostat which also regulates Vulcan fin type radiation below windows.



Left: Instrument panel for Powers MASTROL System of forced hot water temperature control for heating.

Below: Factory fresh air ventilating units heat and filter outdoor air, providing two air changes per hour in winter and ten in summer.



POWERS

New equipment and developments

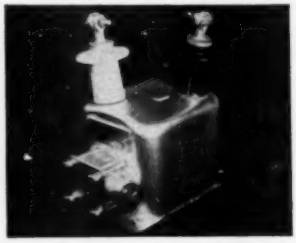
(Continued from page 18)

32—Bearing rollers are aligned at pitch line

Pitchlign bearings, developed by Roller Bearing Company of America, are said to incorporate a new design concept. Cage contact at the pitch line keeps rollers in perfect alignment and minimizes stress and tangential forces. Overall efficiency of the cage is not affected by wear of load-carrying surfaces since it is supported by two integral flanges of the heavy outer race. Bearings can be mounted in any plane and are suited for use on high speed shafts.

33—Potential transformers feature improved insulation

Improved indoor and outdoor potential transformers in the 2400 v class, types PT and PTO, are available from Westinghouse Electric Corp. The units



employ vacuum dried and impregnated crepe paper insulation having high impulse and dielectric strength and low insulation power factor. Available in either 45 or 60 kv full-wave impulse test level, the units meet the 0.3W, 0.3X, 0.3Y, and 1.2Z metering accuracy classifications.

34—Chlorine controller is cam-operated

To meet variations in chlorine demand as they occur, Builders-Providence, Inc. has developed the Automatic Program Controller. Chlorine feed is controlled at predetermined rates for periods in identical cycles. A simple cam-operated pressure valve is used. Cams are interchangeable to meet variations in demand and dosage. Features of the unit include positive and accurate control, pneumatic or water operation, ease of installation and trouble-free service. All major elements are contained in a dust-proof case for panel, wall or floor stand mountings.

35—Drive permits large speed variations

Speed variation up to 9 to 1 is possible with Roto-Cone variable speed units developed by Gerbing Mfg. Corp. A manually adjusted variable pitch motor

pulley is combined with a standard variable pitch pulley and belt. Both pulleys are on fixed centers so that manual adjustment of one automatically affects the other an inversely proportionate amount. Models are available for fractional to 15 hp requirements. Data and information are given in a catalog supplement.

TO REQUEST ADDITIONAL FREE DATA

Insert "key" numbers on return post card found on page 135. Our Reader's Service Department will handle your request promptly

36—Spray gun pump uses separate agitator

An air-operated, double-action reciprocating pump is incorporated in the Paintmaster, a portable, heavy-duty spray gun supply pump. The unit, manufactured by Gray Co., Inc., also uses a separate air-operated agitator. In ad-

dition to most paints, the unit is suited for use with plastic base coatings and many abrasive type materials.

37—Wash and rinse controller prevents back-siphonage

The Permutit Co. has designed an anti-back-siphonage wash and rinse controller to prevent excessive flow rates during backwashing or rinsing, and to eliminate possibility of back-siphonage of waste water. The arrangement is standard on all the company's sodium zeolite softeners over 54 in. diam, and can also be provided for hydrogen zeolite, anion exchange, and pressure type filter equipment. Rate of flow through orifices is held constant by means of a float-operated butterfly valve controlling liquid level. Waste water discharge line terminates above the sump, thus providing an air gap to prevent backflow.

38—Magnetic probe can be carried in pocket

General Scientific Equipment Co. has developed the G-S Magnetic Probe, a fountain pen size instrument employing a high-power alloy magnet. Point of the magnet is extended or retracted from a case—strength of magnet being controlled by amount of extension. Many uses are listed, including re-

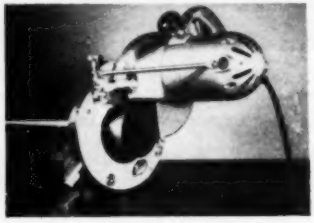
moval of steel or iron particles from the operating area of electrical instruments and delicate mechanisms.

39—Pump packing resists solvents

Resistance to disintegrating effects of aliphatic and aromatic hydrocarbons such as petroleum ether, solvent naphtha, gasoline and toluol is claimed for Sav-On pump packing manufactured by Sea-Ro Packing Co. Available in spiral or ring form, it is said not to swell, soften or disintegrate. Specially formulated binder includes shredded metal, asbestos and lubricating graphite wrapped in cotton casing. Applications include all types of centrifugal, rotary and reciprocal pumps operating below 550 F and 1000 psi.

40—Saw cuts pipe quickly and accurately

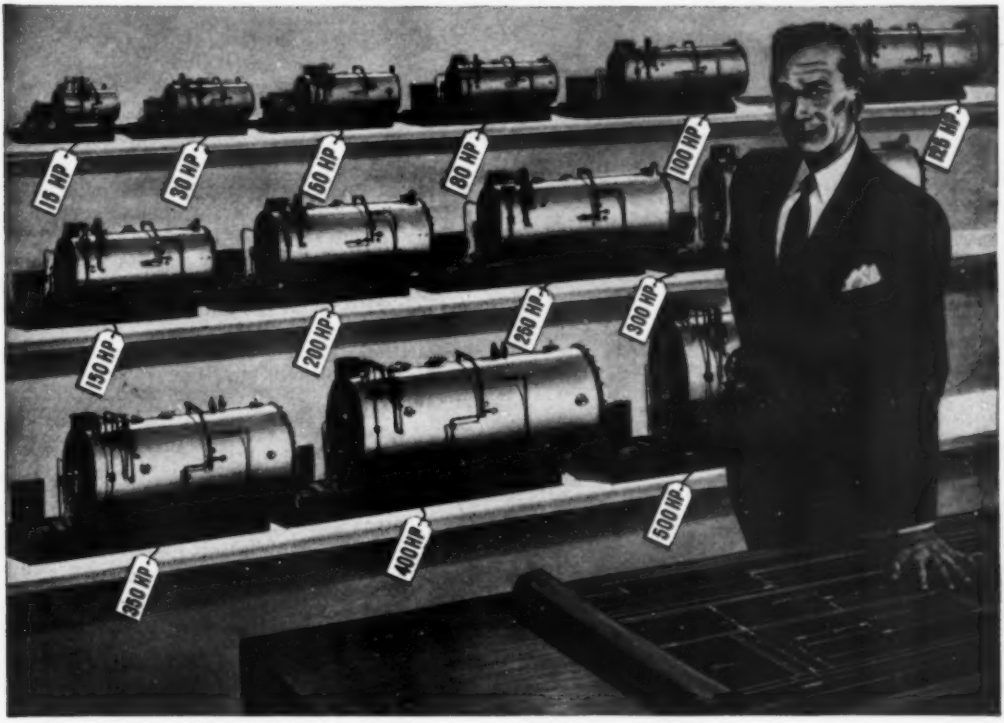
Super Speed abrasive saw, designed for quick, accurate cutting of metal pipe and tubing, is being marketed by Tri-Clover Machine Co. It is portable, light weight, uses 110 v a-c current and



fastens to any bench or bench vise. The abrasive disk cuts quickly through metal, leaving a smooth, square, non-distorted end. Data and instruction sheets present additional information.

(Continued on page 28)

Selecting The Right Boiler Is Most Important...

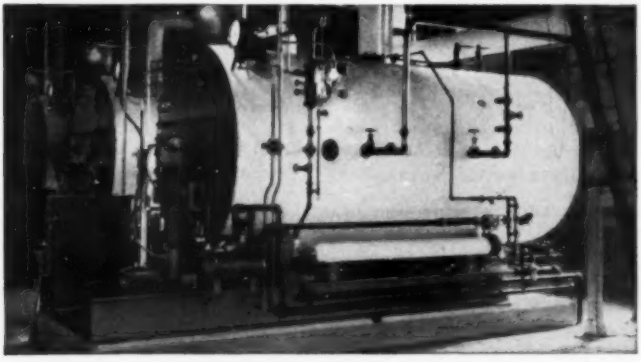


Cleaver-Brooks does not sell steam boilers "off the shelf" even though the boilers are available in standard models. Working with you, your engineers, and your consulting engineers Cleaver-Brooks helps analyze your particular steam needs and loads, both present and future.

These are a few of many factors considered: steam requirements in pounds per hour or b.h.p. — constant or fluctuating loads — fuels available — electric current characteristics — space and boiler room layout — provision for expansion.

Application engineering assistance of this kind assures you a steam plant tailored for your job. Cleaver-Brooks are the first and finest in modern, self-contained steam boilers — operate at a guaranteed efficiency of 80% — burn the fuel most available and economical in your area, gas, oil, or combination gas and oil — fully meet all codes — standard models available in sizes 15 to 500 hp; 15 to 250 p.s.i.

Write for latest, fully illustrated and descriptive Cleaver-Brooks Steam Boiler catalog.

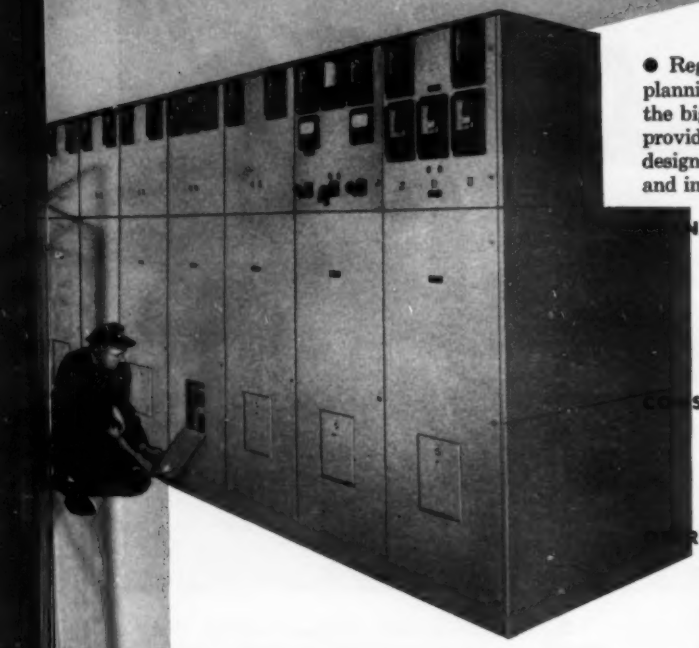


Cleaver-Brooks
STEAM BOILERS

CLEAVER-BROOKS COMPANY
Dept. G 382 E. Keefe Ave., Milwaukee 12, Wis., U.S.A.
Cable Address: Cleabro-Milwaukeewis

Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners

I-T-E METALCLAD SWITCHGEAR



● Regardless of your engineering responsibility—planning, construction, or operation—you'll welcome the big advantages that I-T-E Metalclad Switchgear provides. Since 1937 the soundness of the I-T-E design has proved itself in central stations, steel mills, and industrial plants the world over.

NNING: Planning engineers, concerned with plant wide equipment protection problems in new and expanded distribution systems, prefer I-T-E Metalclad Switchgear because for 15 years, it has assured safe, positive arc interruption. Planning is easier because I-T-E supplies indoor and outdoor equipments in standard structures that are compact, uniform, and readily expandable.

STRUCTION: Construction engineers like the way I-T-E speeds switchgear installation. I-T-E forwards channel bases in advance, so that floors can be prepared ahead of equipment arrival. The arrangement of I-T-E Metalclad Switchgear simplifies the pulling of primary and control cable.

RATION: Operating engineers have to live with switchgear once it's in place. They like I-T-E Metalclad Switchgear because double interlocking makes it safe and easy to operate. The famous "fast-test" feature makes short work of secondary circuit testing—even eliminates opening the breaker door.

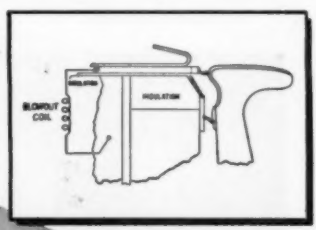
4160 VOLTS • 50,000 AND 150,000 KVA INTERRUPTING • 600, 1200, AND 2000 AMPERES CONTINUOUS

For information, including selection and application data, write for Catalog Section 7004 and Bulletin 7000-A. I-T-E Circuit Breaker Company, 19th & Hamilton Streets, Philadelphia 30, Pennsylvania.

PLANNING ENGINEERS

I-T-E Metalclad Switchgear provides safe, positive arc interruption because I-T-E Type HV circuit breakers are used throughout.

When opening short circuit current near rating, the I-T-E HV breaker interrupts the current so quickly that the moving contact travels only about one inch before the circuit is interrupted. Extra contact travel is provided for interruption of very low current.



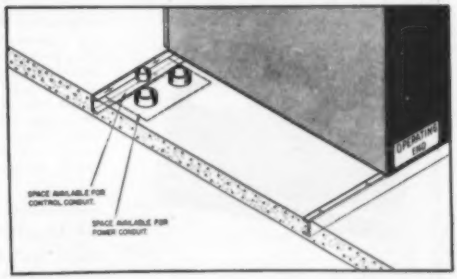
LONG-LIVED INTERRUPTING ABILITY

Arc transfer energizes blowout coil and eliminates metallic connection between front runner and lower current stud. Thus, potential is across arc chute only during arc interruption—resulting in longer chute life.

PROVES ITS ENGINEER APPEAL

CONSTRUCTION ENGINEERS

I-T-E provides switchboard floor plans, front view drawings and single line diagrams well ahead of shipment. When you're ready, I-T-E forwards channel bases—your equipment goes in right on schedule! Control and primary cables can enter structure at top or bottom. Control cable connections are located just inside the removable rear panel. You have them completely accessible for inspection and checking *without* de-energizing the circuit, *without* removing the breaker, *without* entering the switchgear structure.



OPERATING ENGINEERS

Important operating advantages of I-T-E Metalclad Switchgear save steps and guard your safety. Here are just a few of them:

1. Secondary circuit testing without removal of breakers from the stationary structure. No separate operation of secondary disconnecting devices is required.
2. The double interlock assures complete safety of personnel and equipment—guards against improper insertion or withdrawal of the circuit breaker. Interlocks are built into the circuit breaker—eliminating complicated engagement mechanisms between the breaker and structure. Adjustments are simplified and interchangeability is assured.
3. Circuit breaker control-relay is mounted on breaker truck; (when breaker comes out, relay comes out. No "climbing" into structure to inspect control-relay).
4. Truck-mounted horizontal removable elements eliminate hours of maintenance usually required for complicated elevator mechanisms.

Full operating positioning is accomplished by mechanical racking.

Specify I-T-E **METALCLAD SWITCHGEAR**

I-T-E CIRCUIT BREAKER CO. • 19th & HAMILTON STS. • PHILA. 30, PA.

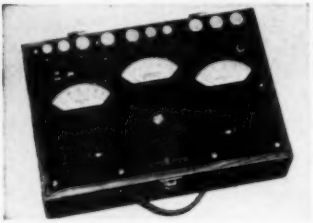
R&IE Equipment Division, Greensburg, Pa. • Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., N.Y. 17, N.Y.

New equipment and developments

(Continued from page 24)

41—*Testers have many applications*

Two instruments, a circuit tester and a power circuit analyzer, have been introduced by Instrument Laboratories. Circuit tester, Model 102, has d-c ranges of: 1, 5, 25, 125, 250 and 500 v; 1, 10,



and 50 ma. A-c ranges are: 5, 25, 125, 250 and 500 v; 0.25, 1, 5 and 25 amp. Resistance scale covers 0-1000 ohm and 0.1 megohm. It is suited for testing signal and alarm circuits, servicing industrial electronic and communication systems, testing motor and lighting loads, and maintenance of power systems.

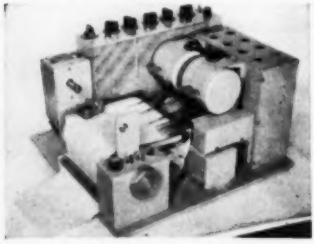
Power circuit analyzer, Model 247, illustrated, has ranges of: 150, 300 and 600 v; 5, 25, and 125 amp; 0.6 to 60 kw. It is valuable in locating unbalanced loads, low power factor, excessive circuit voltage drop, and overloaded, underloaded or defective motors.

42—*Ball bearings have plastic seal*

Sealed ball bearings developed by SKF Industries, Inc. use seals made of Fairprene plastic, said not to be affected by petroleum-base lubricants, normal operating temperatures or ageing. Known as Red Seal, they are interchangeable with conventional non-sealed bearings. Standard single row SAE widths are available, with any combination of snap rings and metal shields.

43—*Recorder-amplifier unit has nine channels*

Rahm Instruments Inc. has announced a recorder-amplifier unit, the Type RO3-E6-1, having nine direct recording channels. The instrument is designed for telemetering applications in which a 0-20 c flat frequency response is required. Three signal channels are provided. Five channels are supplied for off-on functions, and one channel is assigned to an integral time pulse generator.



44—*Unit provides straight-line control*

Close control of electrically heated or fuel-fired industrial process equipment such as small heat treating furnaces and plastic extruders is possible with the Brown pulse Pyr-O-Vane controller. This instrument, developed by Minneapolis-Honeywell Regulator Co., is a time-proportioning, indicating, millivoltmeter controller. It has a variable proportional band between 1 and 3 per cent of full scale. A calibrated adjustment feature facilitates changing the setting. Six cycle times are provided, and changes of cycle time are easily made.

TO REQUEST ADDITIONAL FREE DATA

Insert "key" numbers on return post card found on page 135. Our Reader's Service Department will handle your request promptly

45—*Flow meter has many applications*

Open channel flow meters, Series 500, for measuring, recording and controlling flow of water, sewage, effluent and other liquids have been announced by The Bristol Co. Flow is determined

by measuring head of liquid flowing through a flume or over a weir in the flow channel. Head is interpreted by means of a cam cut to weir or flume equation. Mechanical or electric type meters are available. Descriptive literature has been published.

46—*Tool kit permits field repair of welding hose*

Gas Arc Supply has introduced Fast Fix kit for on-the-job repair of ¼ and 3/16 in. oxy-acetylene hose. The kit contains tools and replacement parts for putting nipple-ferrule-nut assem-

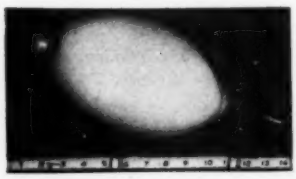
bly on end of hose, permanently splicing hose and temporarily coupling two sections of hose. Finished work equal to that found on original equipment is said to be possible. Available data sheet contains complete information.

47—*Capacitors incorporate drawn-oval container*

Capacitors with reduced size and cost have been developed for electronic applications by General Electric Company's Capacitor Dept. Basic construction is essentially the same as standard fixed paper dielectric types, however the housing is a drawn-oval container having a single hermetically-sealed seam, said to mechanically strengthen the unit. Ratings are 2.0 to 10.0 muf, 600 to 1500 v d-c and 330 to 660 v a-c.

48—*Fluorescent mercury lamp has isothermal shape*

Westinghouse Electric Corp. has developed a 1000 w fluorescent mercury lamp, C-H12, to meet the trend toward



larger manufacturing spaces, higher mountings and higher lighting levels both indoors and outdoors. Providing a golden white light, the lamp has an isothermal shape said to allow the phosphor coating to function at maximum efficiency. Average rated life is 4000 hr at 5 burning hr per start. Open circuit voltage is 220 for normal indoor use with operating voltage of approximately 135.

49—*Feedwater system combines four assemblies*

Feedwater systems for industrial boilers from 15 to 300 hp can be purchased as complete systems or in four separate assemblies for specific jobs, according to the manufacturer, Industrial Div. of York-Shipley, Inc. The four units which make up the complete York-Power feedwater system are makeup, heater, receiver and pump assemblies. Each includes all component parts required to form an individual packaged unit.

(Continued on page 32)

COPPUS "BLUE RIBBON" VENTILATORS

Identified by the blue band

FOR WORKERS'

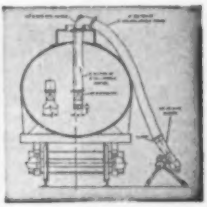
- *Safety*
- *Health*
- *Comfort*
- *Efficiency*

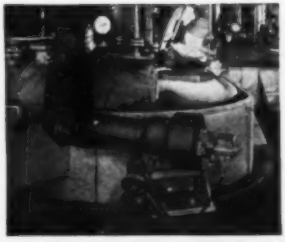
VANO Design "A" VENTILATOR

Vano Design "A" cooling interior of furnace, supplying fresh air through 10 feet of "Ventube" to provide safety and comfort during repair work.

Vano Design "A" delivering fresh air to cable manhole, expelling sewer gas, making entrance safe in a few minutes.

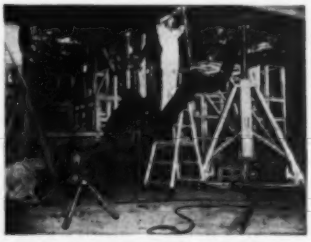
Vano Design "A" Ventilator plus a few accessories feeds large air volume into tank car, driving out fumes, stagnant or hot air for workers' safety and comfort.





Vano Design "A" supplying fresh air in Reactor Room of Synthetic Rubber Plant.

Vano Design "A" Ventilator supplying fresh air to men working in wing compartments, fuselages, etc.



Powered by a ½ hp motor, and equipped with the exclusive Coppus axial-flow propeller-type fan, this general-purpose blower delivers 1500 CFM of fresh air. It supplies ventilation for tanks, tank cars, drums, vats, underground cable manholes, pipe galleries, airplane wing compartments and fuselages, and other confined places. Weighs only 103 lbs. Uses 8"-diameter flexible canvas tubing ("Ventube").

VANO
DESIGN "C"

VENTILATOR-EXHAUSTER

Vano Design "C" equipped with 8" discharge tubing removing welding fumes.

Vano Design "C" equipped with two suction lines removing welding fumes for operators' safety.

For withdrawing welding fumes from confined places or directly from the welding rod ... or for expelling fumes or hot air from enclosed vessels. You can get it with 8" suction inlet for 8" non-collapsible tubing ... or with multiple inlet nozzles for 5", 4" or 3" suction hose. The discharge outlet takes 8" "Ventube". Powered by a ½ hp motor, it weighs only 85 lbs.

COPPUS ENGINEERING CORP., 185 PARK AVENUE, WORCESTER 2, MASS.
Please send information on the Blowers that clear the air for Action.

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fuselages, wings, etc.
- ☐ on cake ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and shafts.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....

(Write here any special ventilating problem you may have.)

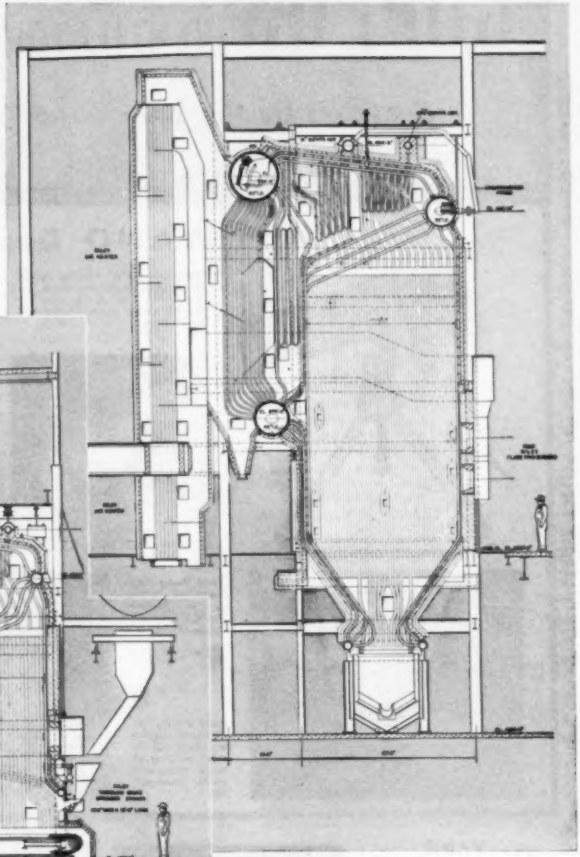
COPPUS "BLUE RIBBON" PRODUCTS—*Designed for Your Industry, Engineered for You*

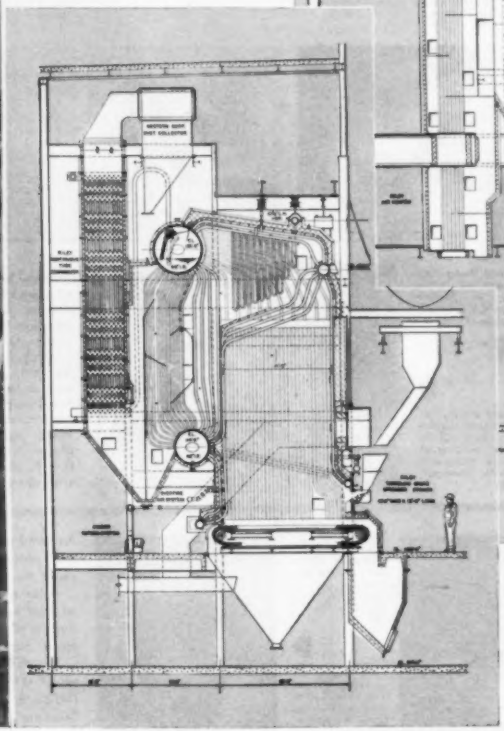
RILEY Boiler Units preferred

Interstate Power Co.
Lansing, Iowa
Sargent & Lundy, *Engineers*

2—120,000 lbs./hr. Riley Units
Steam Pressure—975 lbs.
Steam Temperature—910°F.
Pulverized Coal Fired

Interstate Power Company also has Riley Units in their plants at Clinton and Dubuque, Iowa and Shelbourne Falls, Minn.





Iowa-Illinois Gas & Electric Co.
Iowa City, Iowa

2—60,000 lbs./hr. Riley Units
Steam Pressure—500 lbs.
Steam Temperature—740°F.

Fired by Riley Traveling Grate Spreader Stokers

TRADE MARK
Rx
REGISTERED

RILEY

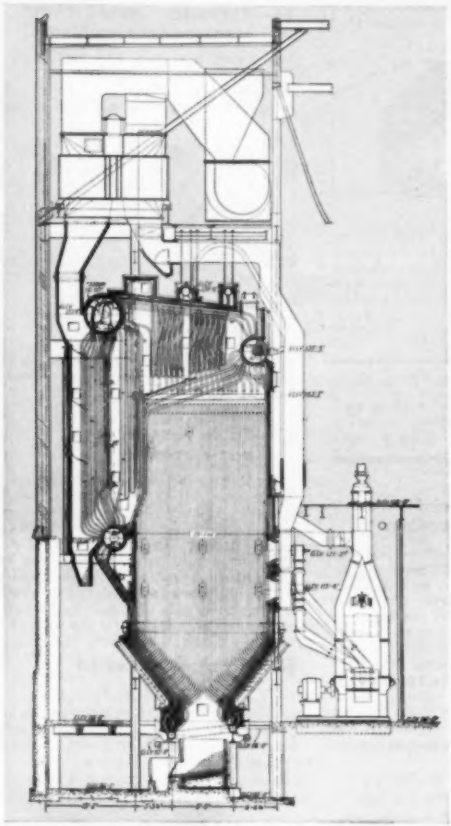
STOKER CORPORATION, WORCESTER, MASS.

Boston Cincinnati · New York Charlotte · Philadelphia Atlanta Denver · Washington New Orleans Salt Lake City · Buffalo St. Louis Los Angeles · Pittsburgh Kansas City Portland · Cleveland St. Paul Seattle · Detroit Tulsa · Chicago Houston

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

out where the corn grows tall

By far the big majority of recent large boiler installations in the state of Iowa have been Riley Steam Generating Units



IOWA-ILLINOIS GAS & ELECTRIC CO., DAVENPORT, IOWA

3—250,000 lbs./hr. Riley Units
Steam Pressure—1000 lbs.
Steam Temperature—850°F.
Fired by Pulverized Coal

Iowa-Illinois Gas & Electric also has Riley Units in their Moline, Ill. and Iowa City, Iowa plants.

All of these Iowa companies have Selected Riley Units in recent years

IOWA ELECTRIC LIGHT & POWER CO.
Marshalltown, Iowa
325,000 lbs./hr. 975 lbs. 910°F.

IOWA ELECTRIC LIGHT & POWER CO.
Boone, Iowa
300,000 lbs./hr. 775 lbs. 835°F.

IOWA-ILLINOIS GAS & ELECTRIC CO.
Davenport, Iowa
3—250,000 lbs./hr. 1000 lbs. 850°F.

IOWA-ILLINOIS GAS & ELECTRIC CO.
Moline, Ill.
2—200,000 lbs./hr. 925 lbs. 825°F.

IOWA-ILLINOIS GAS & ELECTRIC CO.
Iowa City, Iowa
60,000 lbs./hr. 500 lbs. 740°F.

INTERSTATE POWER CO.
Lansing, Iowa
2—120,000 lbs./hr. 975 lbs. 910°F.

INTERSTATE POWER CO.
Dubuque, Iowa
200,000 lbs./hr. 725 lbs. 910°F.

INTERSTATE POWER CO.
Shelbourne Falls, Minn.
2—120,000 lbs./hr. 700 lbs. 910°F.

INTERSTATE POWER CO.
Clinton, Iowa
45,000 lbs./hr. 450 lbs. 465°F.

IOWA PUBLIC SERVICE CO.
Carroll, Iowa
2—60,000 lbs./hr. 475 lbs. 750°F.

CORN BELT POWER CO-OP.
Humboldt, Iowa
125,000 lbs./hr. 700 lbs. 825°F.

CORN BELT POWER CO-OP.
Humboldt, Iowa
165,000 lbs./hr. 1000 lbs. 915°F.

RATH PACKING CO.
Waterloo, Iowa
125,000 lbs./hr. 450 lbs. 675°F.

IOWA STATE COLLEGE
Ames, Iowa
100,000 lbs./hr. 275 lbs. 506°F.

IOWA STATE COLLEGE
Ames, Iowa
80,000 lbs./hr. 260 lbs. 423°F.

CITY OF AMES, IOWA
95,000 lbs./hr. 700 lbs. 830°F.

The majority of the above installations are pulverized coal fired. Some are fired by Riley Traveling Grate Spreader Stokers and others by Riley Traveling Grate Stokers. We believe no other boiler company can point to such a large number of boiler sales in Iowa during the past few years.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

New equipment and developments

(Continued from page 28)

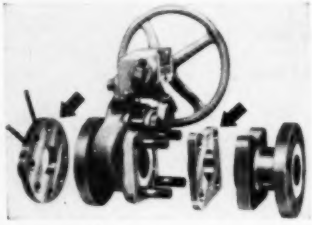
50—V-link belts operate in either direction

Brammer Co. has developed a pre-stretched, detachable V-link belt which can run in either direction and has a high coefficient of friction to prevent

slippage. Special features are said to prevent distortion and permit smooth vibration-free service at top speeds in either direction.

51—Valves are electrically heated

Electrically heated valves developed by Okadee Co. keep valve mechanisms frost-free at temperatures as low as -110 F, as encountered in liquid carbon dioxide lines. Other applications include hot, cold and viscous liquid lines and gas lines. Referring to the illustration, single-disc valves require the heating element at right while double-disc units can be equipped with both ele-



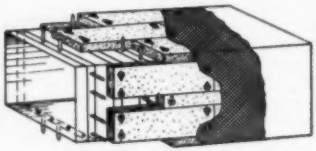
ments. Sizes are from 2 to 6 in., with pneumatic, hydraulic, solenoid or manual control. Elements can be provided for either 110 or 220 v, with input from 400 to 3000 w per valve.

52—Flux is for aluminum or stainless steel

Flux developed for gas welding of aluminum and stainless steel is effective as either paste or powder, according to All-State Welding Alloys Co. Advantages listed for No. 35 flux are: it does not break down, even at temperatures required for stainless steel; does not flake off and leave surface unprotected causing rough bubbly weld; it spreads thinly and evenly ahead of flame; cleans oxides efficiently; floats impurities out of puddle; protects metal on each side of weld area; and cleans easily.

53—Strapping is for fastening insulation

Insulation materials can be quickly and permanently applied to pipes, ducts, tanks and walls with a metal strapping called Finger Strap, developed by A. J. Gerrard & Co. Tapered fingers, ¼ in. wide, are spaced at specified intervals along ¾ in. strapping. Strapping is applied around surface with strapping tool. Holes are provided



for nails or screws when used on flat surfaces. The fingers pierce the insulation and a slit washer is placed over the protruding portion. The tip is then bent firmly back against the washer. Illustration shows application on ducts.

TO REQUEST ADDITIONAL FREE DATA

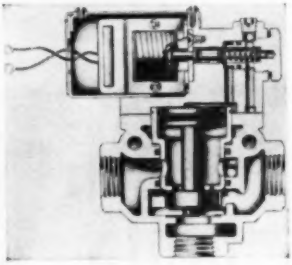
Insert "key" numbers on return post card found on page 135. Our Reader's Service Department will handle your request promptly

54—Insulating material has many applications

Recommended applications for an improved weight-saving insulating material, known as Ultralite, include thermal acoustical insulation of heating, ventilating and air conditioning equipment, insulation for metal buildings and general piping applications. Produced by Gustin-Bacon Manufacturing Co., it is said to be resilient, dimensionally stable and virtually indestructible. Made of glass fibers bonded with thermosetting plastic resin, it has recently been adapted for use in the insulation of railroad cars.

55—Valves feature versatility

Pilot-master valves for directional control of air pressure have been announced by Hannifin Corp. The master



valve portion can be operated either 2 or 3 way, normally open or normally closed to pressure, without internal changes. The master valve is pressure operated through a piston operated poppet. Pilot head employs a 3 way solenoid operated pilot valve to control the master valve by introducing pressure into or exhausting it from the chamber above the piston. Five main valve bodies from ⅜ through 1¼ in. IPS are available.

56—Pyrometer meets many measurement problems

Pyro surface pyrometer, designed by Pyrometer Instrument Co. for accurate surface and sub-surface temperature measurements, is available with 14 types

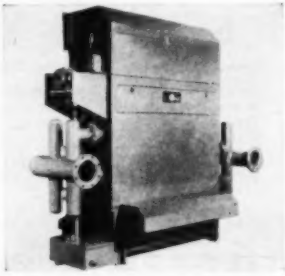
of thermocouples and extension arms. Thermocouples, interchangeable without adjustment or recalibration, can be quickly locked onto extension arms. Swivel permits locking thermocouples at any desired angle.

57—Scale remover is non-corrosive

Scale forming in pipes, evaporators, condensers, heat exchangers, water heaters and coils can be safely removed with Rydlyme solvent, according to the manufacturer, Apex Engineering Co. The product is non-corrosive, yet has fast-dissolving qualities. When applied, scale disappears as harmless gas. Water is completely safe for drinking purposes after pipes are cleaned by the solvent.

58—Aftercooler design is improved

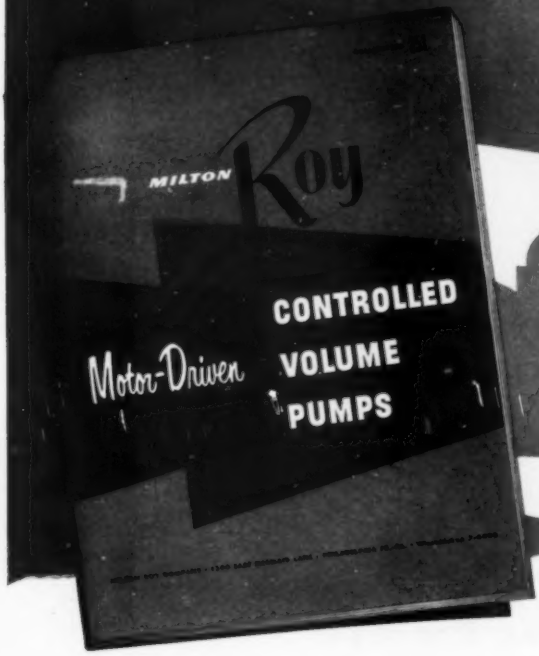
Niagara Blower Co. announces an improved design of the Aero aftercooler, for compressed air or gases. Cooling



capacity is said to be increased from 25 to 75 per cent over previous models. Cooling is by evaporation of recirculating water sprays on the surface of tubes through which compressed air passes. Increased capacity is gained by improved distribution of compressed air and by increased evaporating surface.

—End

Motor-Driven CONTROLLED VOLUME PUMPS



Complete Information In These Pages

What *are* Milton Roy Motor-Driven Controlled Volume Pumps? What materials do they pump? How and where are they used? What different designs and models are available?

The answers to these questions and many more can be found in Bulletin No. 251. This illustrated, 24-page, 2-color bulletin is full of important details. Here is a preview of some of the subjects which are discussed:

- a description of various Milton Roy Motor-Driven Controlled Volume Pumps—the Simplex, Duplex, Constametric, "Titronic," and "miniPump."
- an explanation of the exclusive Milton Roy Liquid End Step-Valve design. This information is useful because it describes the "how" and "why" of this unique non-clogging, self-cleaning liquid end.
- a description of pump capacity regulation by *plunger stroke* adjustment, including screw adjustment, micro adjustment, motorized micro adjustment.
- details on pump capacity regulation by *plunger speed* adjustment, including speedranger adjustment, "Thymotrol" adjustment, Link Belt P.I.V. adjustment.
- data on where Milton Roy Motor-Driven Controlled Volume Pumps can be used.
- capacity-pressure selection tables are included.

If your operations call for pumping liquids in accurately measured volume in amounts as low as 3 milliliters per hour or as high as 50 gallons per minute, we're sure Bulletin No. 251 will be of value to you. For your free copy, write the Milton Roy representative listed in your local classified telephone directory. Or, write directly to us.

Manufacturing Engineers

WITH THE EXCLUSIVE STEP-VALVE DESIGN

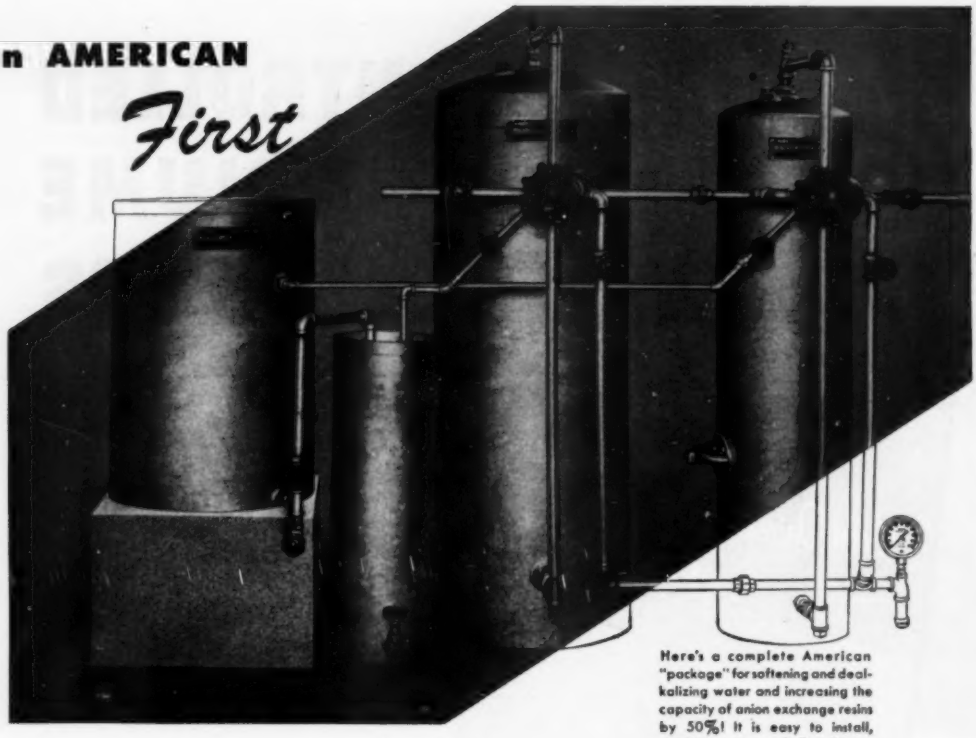
MILTON Roy COMPANY

1319 EAST MERMAID LANE, PHILADELPHIA 18, PA.

CONTROLLED VOLUME PUMPS AND AUTOMATIC CHEMICAL FEED SYSTEMS

an AMERICAN

First



Here's a complete American "package" for softening and dealkalizing water and increasing the capacity of anion exchange resins by 50%! It is easy to install, simple to operate, built to last.

new, safe Dealkalization Process*

that saves you up to 33%

With this new process equipment developed by American, capacity of anion exchange resins is easily increased from 33 to 50%.

These resins function to adsorb objectionable sulfates, carbonates and other anions from water. With only common salt used as the regenerant, however, it was found that exchange capacity of the resin was extremely low, due to the formation of blanketing gases which prevented complete regeneration of the resin bed.

American engineers found the answer. By raising the pH of the regenerant solution the tendency toward gas blanketing of the resin is eliminated.

This process increases the capacity of the exchange bed and greatly improves the quality of the effluent.

American engineers are specialists in all types of water treatment with a background of successes for over half a century. Regardless of your problem, their experience will enable them to find a solution. Why not get in touch with them. Write today for details of this new process.

**Patent applied for.*

CELEBRATING OUR FIFTIETH YEAR

AMERICAN *Water Softener* COMPANY

330 W. LEHIGH AVENUE • PHILADELPHIA 33, PENNA.

FILTERS • SOFTENING SYSTEMS • CHEMICAL FEEDERS • ION EXCHANGERS • RE-ACTORS • SWIMMING POOL EQUIPMENT • DE-GASIFIERS • WATER TEST SETS • RE-CARBONATORS • ALKALIZERS

clarify wastes at least cost...

the Cyclator®

meets disposal requirements best...

1 Because the Cyclator combines recirculation for more complete clarification and faster settling with mechanical thickening for maximum sludge compaction... you gain greatest B.O.D., oil and suspended solids reduction at considerably higher flow rates than in "old style" disposal plants.

2 Because the Cyclator increases purification rates and eliminates the need for large chemical mixing, coagulating and settling basins, you save space... save on first costs.

3 Case histories of Cyclator operation dramatically

(continue to next page)

INFILCO
since 1894

(continued from preceding page)

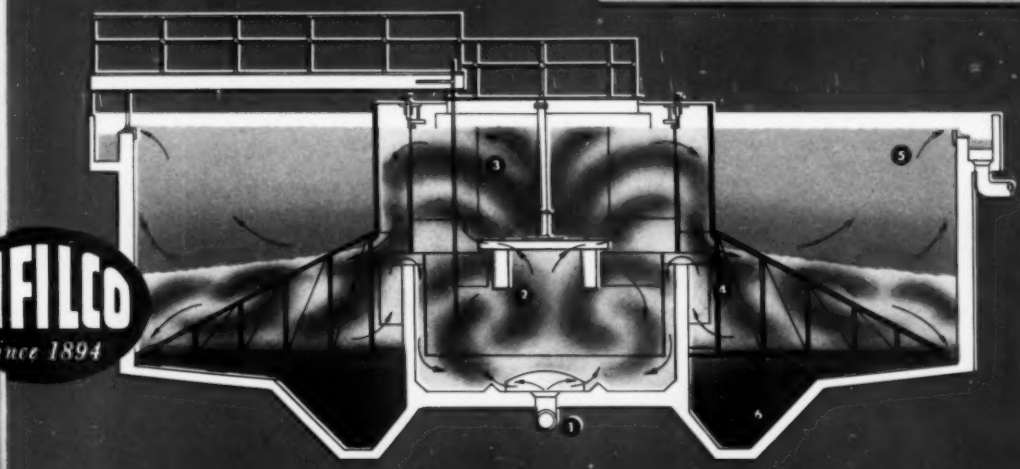
illustrate the vital point that the Cyclator will clarify wastes to your local requirements at least cost. Write for Bulletin 850A — containing data and case histories which show how the Cyclator exceeds expectations for processors everywhere — North America, South America, Europe.

INFILCO INC. ★ *Tucson, Arizona*

Here's how the Cyclator EXCEEDS waste disposal requirements

- ★ Space-savings up to 80% in comparison to "old-style" treatment plants.
- ★ By-product recovery and water re-use pay for Cyclator operation in many cases.
- ★ Removes suspended and colloidal solids, oils and toxic compounds rapidly and efficiently.
- ★ Throughput is extremely high because chemical feeding, recirculation and mechanical thickening are perfectly balanced in a single basin.
- ★ Reduces chemical costs because most efficient mixing is attained with recirculation.
- ★ Effluent purified to the degree required to meet pollution control regulations.

INFILCO *since 1894*



"EXPLAIN-MORE" DIAGRAM

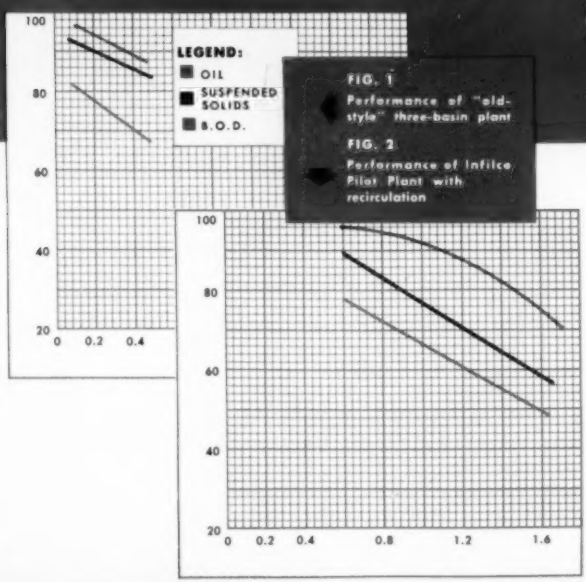


FIG. 1 Performance of "old-style" three-basin plant

FIG. 2 Performance of Infilco Pilot Plant with recirculation

TAKE A LOOK AT PROCESS SAVINGS—

Here's a recent pilot plant study. An Infilco pilot plant was installed in parallel with a treatment plant with separate mixing, flocculating and sedimentation basins.

Both plants treated oil-bearing wastes. Alum and activated silica were used as the coagulants. Figure 1 shows that the three-basin plant operated at a rise rate of only 0.2 gpm per square foot for about 95% oil removal. Slightly higher removal was gained with the Infilco plant and at a rise rate of 0.6 gpm!

The result: two 100-foot diameter Cyclators were installed by a large Eastern refinery to treat waste at 3700 gpm. Process savings like this are typical of Cyclator installations. When you need facts for waste disposal at least cost, ask for Infilco's specialized experience . . . there's no obligation for preliminary planning.

JZ JOHN ZINK Combination Gas and Oil Burner

For Horizontal Firing

SERIES CBM

Provides better combustion with either gas or oil or combination firing, heat pattern is approximately the same with each fuel. Sizes CBM-12 to CBM-30. Also available for forced draft operation. Can be furnished for horizontal firing (as shown) or vertical firing.

The John Zink Series CBM burner combines the high efficiencies of the well proven John Zink BI-MIX Gas Gun and the steamizer type MS Oil Gun. A special tile and register design permits operation at low excess air.

The CBM will handle any gaseous fuel at pressures in excess of 5 lbs., and any commercial grade of fuel oil delivered to the burner with a viscosity of not more than 25SSF.

John Zink and his engineers manufacture more than 50 types of gas burners, oil burners and combination burners for domestic boilers, heating boilers, industrial boilers and power boilers.

Remember John Zink also designs smokeless Field Flare Burners and Direct Fired Air Heaters.

Another JZ Heat Maker

Write for Bulletin CBM.

JOHN ZINK CO.,

4401 So. Peoria Ave.
TULSA, OKLA.

Now, say FLEXON

when you specify expansion joints for piping

Free-flexing units in stainless steel or copper for pressures to 30 psi; sizes to 48" I.D.
Controlled-flexing units in stainless steel or copper for pressures to 300 psi; sizes to 48" I.D.
Integral ring units in stainless steel for pressures to 5500 psi; temperatures to 1600° F; sizes to 6" I.D.

WITH the change of our corporate name from Chicago Metal Hose Corporation to FLEXONICS Corporation, CMH Expansion Joints are now known as FLEXON Expansion Joints. Just as the corporate name was changed to better describe the company's manufacturing activities, the name FLEXON should allow easier identification of these units.

Wherever motion is encountered in piping, the problem can be solved with FLEXON Expansion Joints. These dependable units are easily installed in new or existing lines and require only slightly more space than straight pipe. They cannot leak and require no maintenance.

Write for our new Expansion Joint "Design Guide". And remember, when you specify expansion joints, you now say, "FLEXON".

Flexonics *Corporation* **EXPANSION JOINT DIVISION**
1335 S. THIRD AVENUE · MAYWOOD, ILLINOIS

FORMERLY CHICAGO METAL HOSE CORPORATION

Flexon identifies products of Flexonics Corporation that have served industry for over 30 years.

Manufacturers of Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals · Expansion Joints for Piping Systems · Stainless Steel and Brass Bellows · Flexible Metal Conduit and Armor · Assemblies of These Components
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

B.F.Goodrich GROMMET BELTS AT WORK

When this plant is running there's so much dust it looks like a fog on the mountain—a fog of oyster shell dust.

Oyster fog–slippery driving

Thirty miles inland, up in the California mountains, a vast deposit of oyster shells was found. Wonderful for poultry when crushed. But crushing the shells creates dust, and that caused the belts needed to run the crusher to slip, burn, then wear out. At every frequent belt failure, the whole plant had to be shut down while they were changed. It took an entirely different kind of belt to solve the problem—as shown on the following pages.

Oyster fog (continued)

It's slippery driving for belts running in a fog of oyster shell dust at Western Lime Products Co., Santa Suzanna, California.

The problem described on the preceding page was solved when B. F. Goodrich grommet V belts were installed. Grommet belts are more flexible, don't slip or stretch as much as ordinary belts. Now BFG grommet belts are lasting 2 to 3 times longer than any other belt ever used in this plant before. This performance is typical, not unusual at all. Here's the reason grommet belts last longer, serve better, save money.

20 to 50% Longer Life

Patented grommet V belts by B. F. Goodrich represent the only basic improvement since invention of the V belt. Belts last 20 to 50% longer, de-

pending on service. (The more severe the service the greater the increase over ordinary belts.)

What is a grommet?

A grommet is like a giant cable except that it's endless—a cord loop built up by winding heavy cord on itself. There is no overlapping cord *section* as in all ordinary belts. Most belt failures occur in these sections where cords overlap!

All Cords Put to Work

Each grommet and every part of a grommet carries its share of the load. In ordinary belts under high tension the center cords "dish" because tension is greater near the driving faces. Dished cords are doing less work, not pulling their share. Grommet V belts have no center cords, there is no dishing—therefore much more strength in proportion to cord volume.

Better Grip, Less Slip

Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor.

They Cost No More

You save belt costs because belts last longer, reduce production costs because machines keep running with fewer interruptions, reduce maintenance costs because they need less attention, yet cost not one cent more than others. Grommet belts are made in C, D and E sections. They are patented by B. F. Goodrich. No other V belt is a grommet belt (U. S. Patent Number 2,233,294).

See "X-ray" Belt

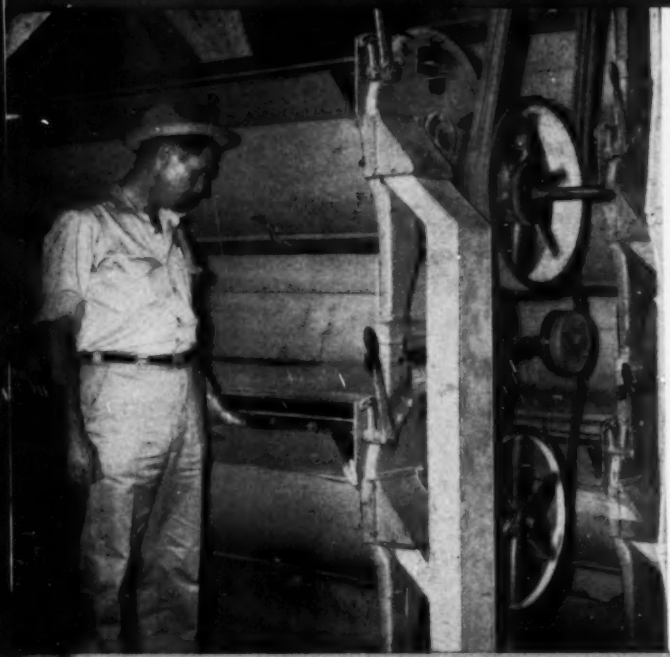
A special demonstrator "X-ray" belt has been made to show the grommet construction. Ask your local B. F. Goodrich distributor to show it to you.

Whirl beater ➸

These belts run at top speed all day, supplying power to a pulp beater—the first step in making paper. It's tough service for V belts, but these B. F. Goodrich grommet V belts have stood the shock and strain for four years now, and still look good for years' more service at Peter J. Schweitzer, Inc., Lee, Massachusetts.

Belts whirl, pulp is beaten, then out of this plant comes cigarette paper.

B.F.Goodrich GROMMET BELTS AT WORK



Pass the rice

Inside that machine are hundreds of moving discs, with tiny pockets in them. They scoop up rice grains from troughs at the bottom, and carry whole grains up and over to be packaged. Smaller things like weed seeds and broken rice grains fall out and away. It's machines like this that make rice so cheap, but not if the machine shuts down. And the driving mechanism used was breaking on the average of every 4 days. B. F. Goodrich grommet V belts solved the problem. The set you see in the picture has already lasted over a year, and the machine has never been stopped a single moment for belt attention.

Machines shuffle and deal rice at Arkansas Rice Growers Coop. Assn.

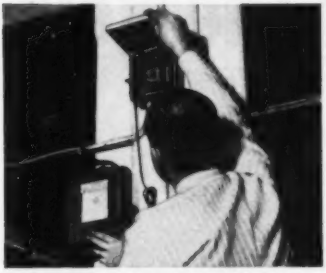
These typical examples (see preceding pages) tell you why B. F. Goodrich grommet belts are superior to ordinary V belts — prove they last 20 to 50% longer—yet cost no more.

Grommet V Belts BY
B.F.Goodrich
FIRST IN RUBBER

The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio

TESTING TIPS

for the maintenance of plant equipment

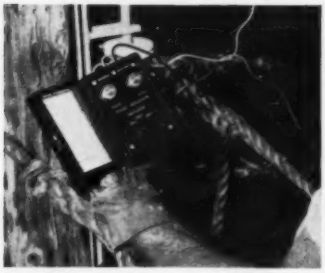


CF-1 INKLESS RECORDER

Accuracy: ±2% full scale

No ink to freeze or evaporate. Available for either a-c or d-c operation, with charts lasting up to 30 days.

PRICES START AT—$107.47*



PHASE SEQUENCE INDICATORS

Rating: 120/240/480 volts or 120/240/600 volts

Pocket-sized device for phase sequence of polyphase circuits. Just connect 3 leads to read.

PRICES—$28.14 or $31.77*

HIGH ACCURACY PORTABLES

Accuracy: ¾ of 1% full scale for AP-9 (a-c)
½ of 1% full scale for DP-9 (d-c)

Compact, small portables for precision measurements. Available in either a-c or d-c models.

PRICES START AT—$42.01*

L & P Electric Co. Cuts Testing Time 75% With Complete Line of G-E Instruments

Motor repair work simplified by three hook-on instruments

L & P Electric Co. of Brooklyn, N. Y., an authorized G-E agent and distributor, has a large service shop where it does extensive repair and reservice work on motors and their associated equipment. Mr. L. Lidsky, President of L & P, reports, "We have been able to cut our testing time by 75% by using G-E hook-on instruments to locate the faults in motors that are brought to us for repair. Our complete line of six G-E testing instruments (the AK-1, AK-2, AK-3, phase sequence indicator, CF-1 recording voltmeter, and Type AP-9/-DP-9 portables) has enabled us to reduce our maintenance costs by 25%.

AK-1 VOLT-AMMETER

Handy-portable instrument measures both volts and amperes over a range of 15-600 amperes, and 100-600 volts. It maintains an accuracy of ±3 per cent full scale. It's used primarily for motor checks of polyphase circuits. Price—$76.77*.

AK-2 WATTMETER

The AK-2 measures a-c power easily. Both single and polyphase circuits can be analyzed; in addition to kilowatts it will measure vars in balanced three-phase circuits. It will measure up to 300 KW, 15-600 amperes, and 100-600 volts with a full-scale accuracy of ±5 per cent. Price—$87.00*.

AK-3 POWER FACTOR METER

Accurate to within 0.05 PF, the AK-3 power-factor meter can be used on any balanced 3-phase circuit. It reads power factor directly in the circuit. When making capacitor surveys, you'll find the AK-3 a valuable time saver. The table above shows what you can expect from adding capacitors to your feeder lines. The AK-3 is rated 100-600 volts and 15-600 amperes. Price—$87.00*.

If your power factor is now	you can release this much extra capacity	with this many capacitors for each 100 kw of load
65%	34%	84 kvar
70%	29%	69 kvar
75%	23%	55 kvar
80%	17%	42 kvar
85%	11%	29 kvar
90%	5%	15 kvar

(Power factor is raised to 95%. New load is at original power factor.)

658-236

*Manufacturer's suggested price.

BUY NOW
From Your Nearest G-E Distributor

GENERAL ELECTRIC

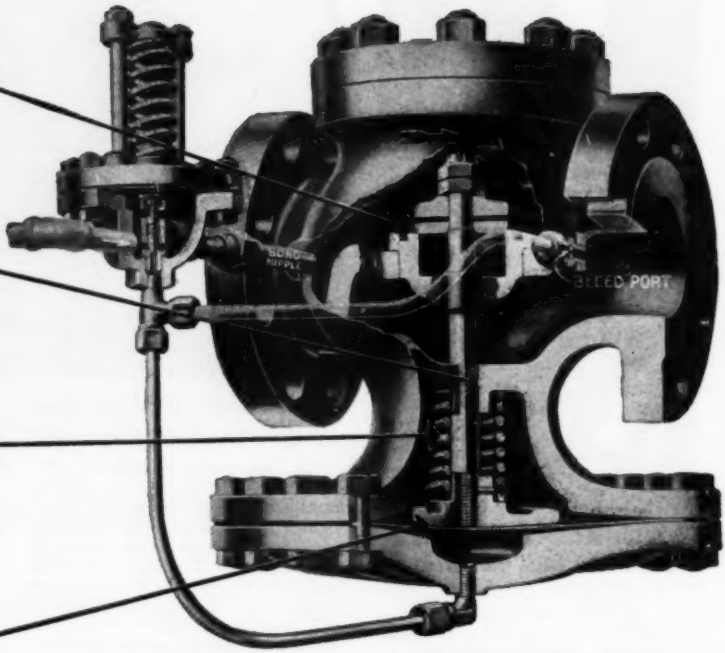
WHY Spence Regulators Outlast The Field

SECO METAL SEATS AND DISCS — Durable SECO Metal resists wiredrawing. More than *twenty years of experience* in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

PACKLESS CONSTRUCTION — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

SPRING OUT OF PATH OF STEAM — The spring in the Spence Regulator is out of the path of the steam or other fluid flowing through the valve. It operates at low unit stress for exceptionally long life.

LARGE BALANCED DIAPHRAGM—Spence metal diaphragms, under usual conditions, never require replacement. Spence Regulators have few moving parts and those few are ruggedly constructed and seldom require attention.



Spence Type EQ back pressure regulator — operation of main valve is controlled by a sensitive pilot to regulate the initial pressure. Same pilot is used with all sizes of main valves.

The features shown above explain why you profit on every important count with Spence Pressure and Temperature Regulators.

Learn more about these and many other advantages of Spence Regulators by sending for Bulletin 350.

DURABILITY — Spence Regulators perform dependably year after year.

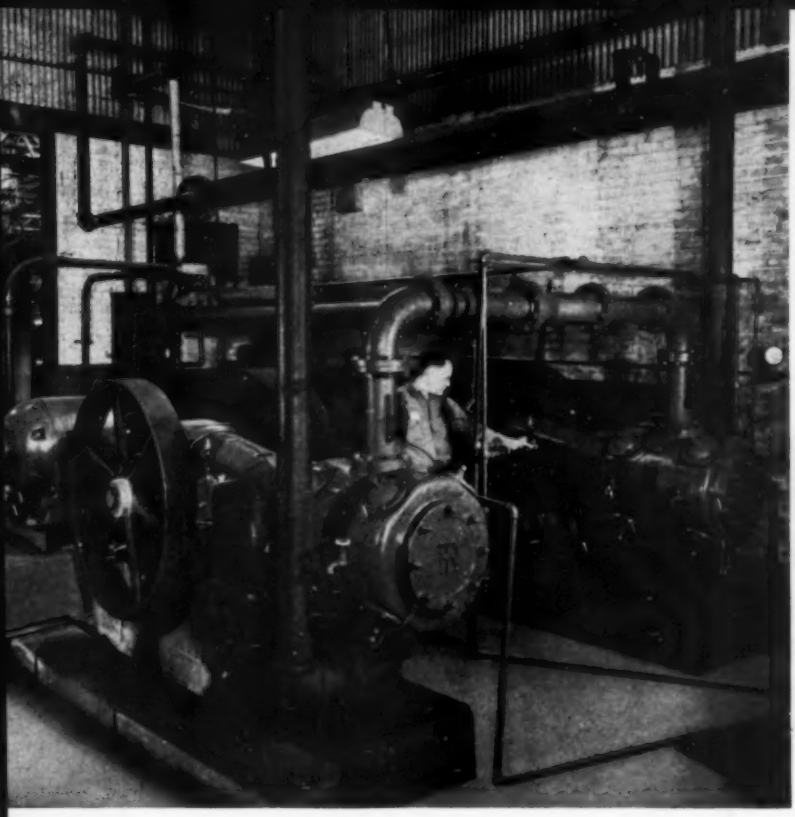
ACCURACY — You can be sure of accurate control for the life of the regulator.

MAINTENANCE — You don't need expensive repairs or special maintenance. That means less down-time, less time and money wasted on replacement of parts.

SB-110

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

Spence



Compressors give carbon the air

• When carbon formed on the valves of these air compressors and the oil in the crankcases had to be changed frequently, operators of this Midwest plant called in a Standard Oil lubrication specialist. He recommended STANOIL Industrial Oil, a multi-purpose oil having a low carbon-forming tendency and containing effective oxidation and corrosion inhibitors. With STANOIL, the compressors gave the air to carbon troubles and have breezed through four years of hard operation without difficulty. Over the oil previously used, STANOIL has given four times longer service in the crankcases. These results . . . similar to the results you may expect . . . have led to the use of STANOIL in other equipment in this plant.

STANOIL
TRADE MARK
Industrial Oil

Find how this multi-purpose oil can benefit you by discussing it with a Standard lubrication specialist. You can contact him by phoning your local Standard Oil office.

Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Send for this booklet...

See what Stanoil offers you...

You'll find the means to significant savings in this booklet. It describes the important qualities of STANOIL Industrial Oil and the resultant benefits which have made this multi-purpose oil the choice of midwest manufacturers for a host of important lubricating jobs. Discover how STANOIL will give you superior protection through its unique combination of six outstanding characteristics, including high stability and effective rust prevention. Find how STANOIL can simplify stock, storage, and inventory in your plant by replacing special-purpose oils in hydraulic systems, speed reducers, air compressors, machine tools, electric motors, auxiliary turbines, and a wide variety of circulating, bath, and bearing systems. Ask the Standard Oil lubrication specialist from your nearby Standard Oil office for this booklet, or write: Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago.

STANDARD OIL COMPANY **STANDARD** *(Indiana)*

IT'S PACKED WITH SATISFACTION WHEN IT'S PACKED WITH **R/M**

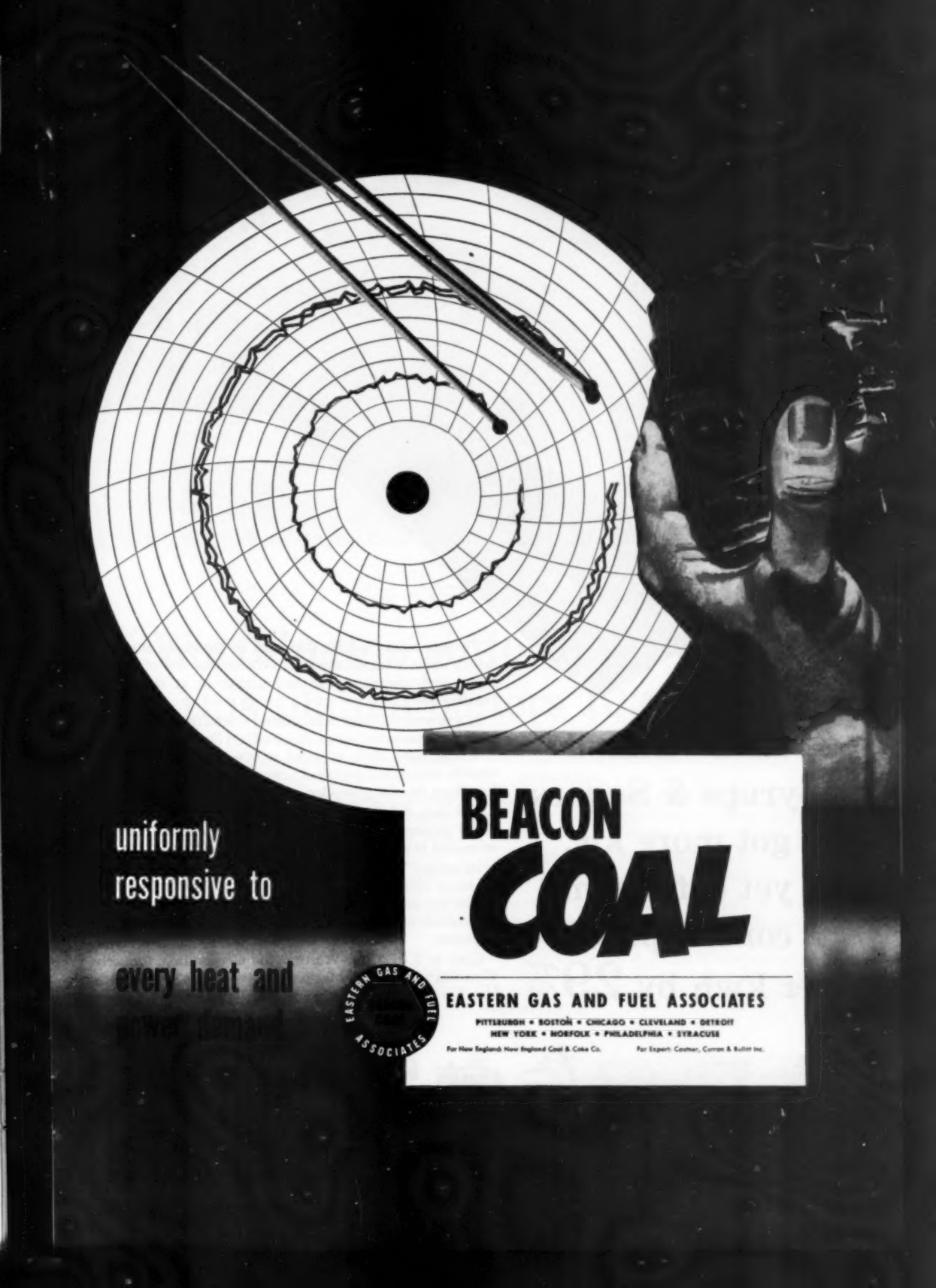
In hydraulic systems, as in this hydraulic accumulator ram, and all kinds of fluid-handling equipment, Raybestos-Manhattan Packings and Gaskets are assurance of continuous trouble-free operation. The R/M distributor near you will help you select the right R/M Packings and Gaskets for your valves, pumps, compressors, tanks and other equipment. Call him in.

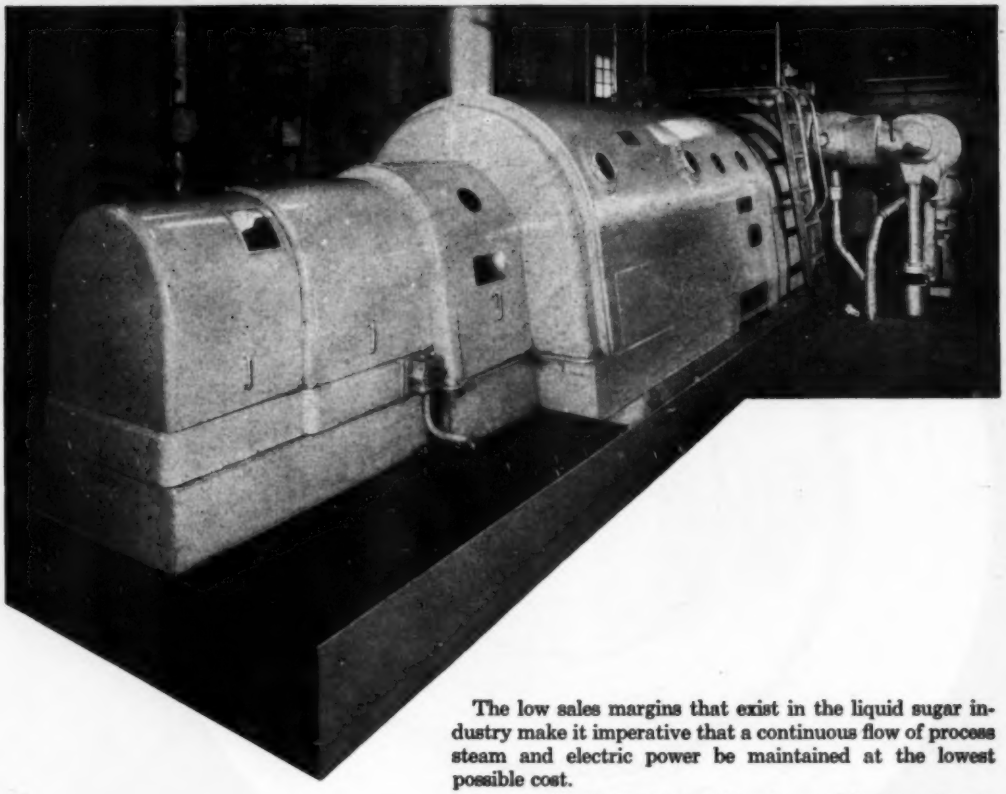
R M **PACKINGS**

RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Crawfordsville, Ind.; Passaic, N.J.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Manufacturers of Packings • Asbestos Textiles • Mechanical Rubber Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Sintered Metal Products • Bowling Balls


uniformly
responsive to
every heat and
power demand
BEACON
COAL
EASTERN GAS AND FUEL ASSOCIATES
PITTSBURGH • BOSTON • CHICAGO • CLEVELAND • DETROIT
NEW YORK • NORFOLK • PHILADELPHIA • SYRACUSE
For New England: New England Coal & Coke Co.
For Export: Castner, Curran & Bullitt Inc.
EASTERN GAS AND FUEL ASSOCIATES



How Refined Syrups & Sugars got more kw, yet cut steam consumption per kwh by 29%

The low sales margins that exist in the liquid sugar industry make it imperative that a continuous flow of process steam and electric power be maintained at the lowest possible cost.

It was with this fact in mind, and a need for more electric power at economical rates, that Refined Syrups & Sugars of Yonkers, New York, replaced existing steam drives with electric motors and installed a modern Worthington 2,000-kw steam turbine generator.

Not only did this arrangement meet the need for added power requirements, but also reduced the amount of steam consumed in generation of power by 29% per kwh.

By going "Worthington", Refined Syrups & Sugars—like the many other Worthington users—found that unit responsibility has its rewards. Each Worthington turbine generator is designed, assembled and tested *as a complete unit* before shipment.

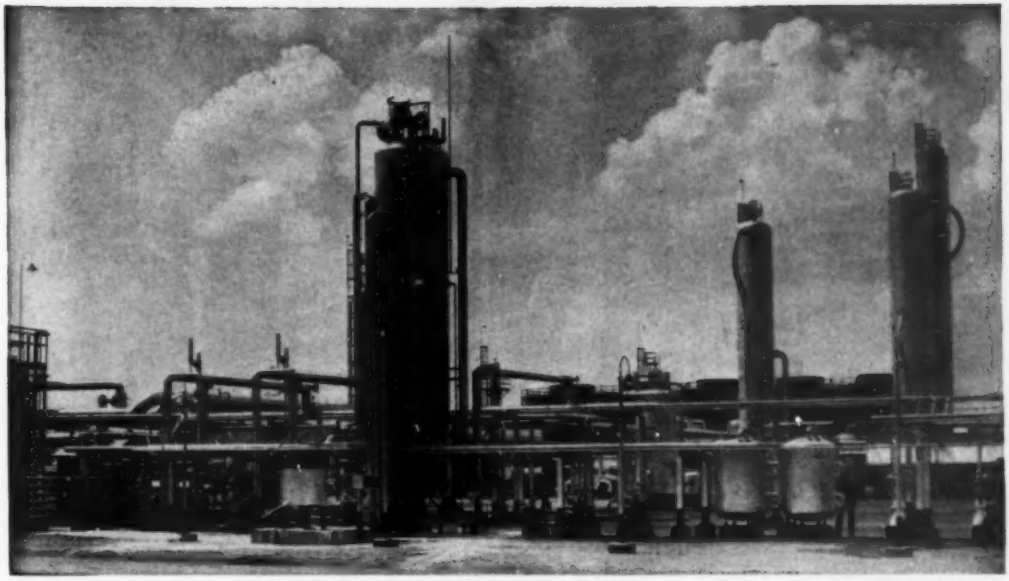
Sizes to 10,000 kw. Worthington Corporation, formerly Worthington Pump & Machinery Corporation, Steam Turbine Division, Wellsville, New York.

T-2-17

A GREAT TEAM IN STEAM

WORTHINGTON

Steam Turbine Generators



NORTH COWDEN GASOLINE PLANT near Odessa, Texas, operated by Stanolind Oil and Gas Company. Here Worthington Water Softeners protect boilers from scale-forming deposits.

Worthington softeners protect this plant's boilers 10 ways

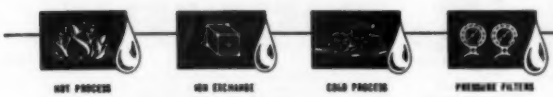
In this case, it's a hot-process softener to remove scale-forming deposits from boiler feedwater.

Let's examine this gasoline plant installation and see how it gives boilers "maximum" protection:

1. *Feed water is softened* by a hot-lime soda system.
2. *Selective deaeration* for operation on make-up only, condensate only, or both.
3. *Non-scaling direct-contact vent condenser* heats and vents treated make-up.
4. *Tubular vent condenser vents condensate.*
5. *Oxygen contamination of feedwater avoided* by last-step deaeration.
6. *Stainless steel deaerating elements.*
7. *Uniform and efficient deaeration* during wide load swings.
8. *Filter backwashing* with clean, hot, chemically inert water without velocity change through the softening zone.
9. *Proportionate sludge removal.*
10. *Uniformly proportionate chemical feed.*

Before you buy, investigate Worthington Water Softening Systems thoroughly. Tell us the service conditions, and get our recommendations in terms of dollars and benefits. Write Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Water Treating Section, Harrison, N. J.

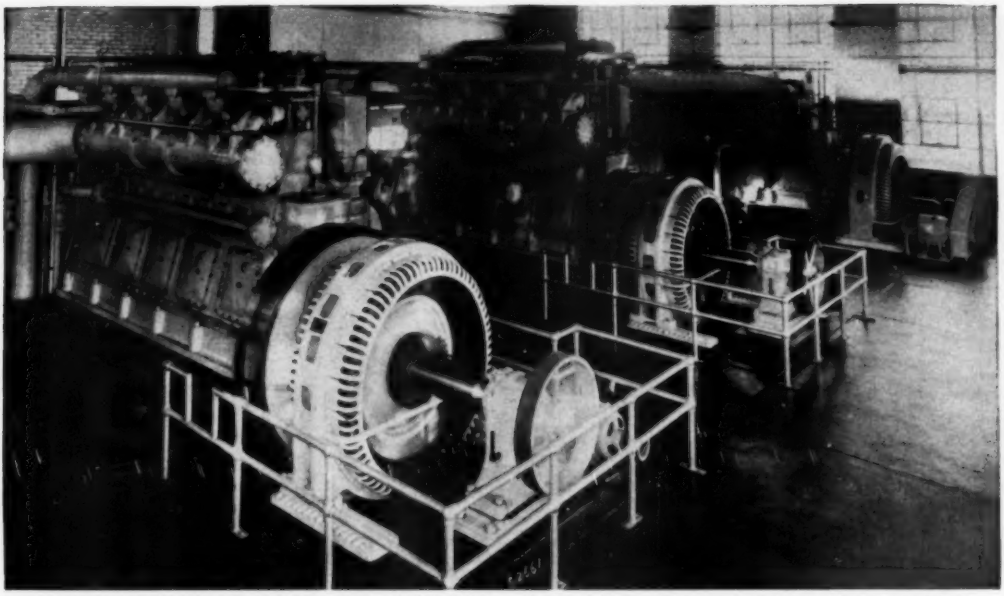
J.1.4



Worthington Makes More of the Equipment for ALL Types of Water Conditioning Systems

WORTHINGTON

Water Conditioning



ENGINES IN FOREGROUND ARE ORIGINAL UNITS installed in 1939. Background engine is the latest supercharged unit installed in 1950. Another supercharged unit, placed in service in 1947, is not shown in this view. The output of this plant has increased from 952,600 kw hrs for the first year to 3,792,900 kw hrs for the year ending December 31, 1951.

Power plant is financial asset for city of Odessa, Missouri

PROFIT used to pave streets, pay off water and sewage bonds, operate water department, and to pay for power plant itself.

Odessa, Missouri, is an agricultural trading center 38 miles east of Kansas City.

In 1939 the town took a big step—they started operation of a power plant that has since provided the small part-farm, part-suburban community with continuous, dependable, economical power. And equally important, it brought new income that did more than pay for power plant operation.

It also helped pave the streets, pay off water and sewage bonds, and is paying off the cost of the new plant itself.

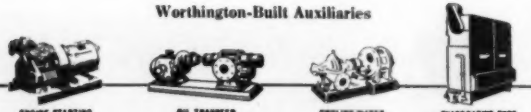
In spite of the high profitability of plant operation, rates have been lowered twice, and are today as low as can be found anywhere in the state.

Much of the credit for the success of the plant goes to the high operating efficiency of the four Worthington Diesels. After the two original units had been in service about eight years, the first supercharged engine was installed in 1947. An additional supercharged unit was placed in service in 1950. Present output of the plant is 13.5 kw hrs per gallon with a load factor of 69.5%. The two supercharged engines—at this same load factor—averaged 14.0 kw hrs per gallon.

If you are interested in learning more about how modern Diesels, dual fuel, or high compression gas engines can help you reduce your power bills, write to Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.

E.2.3

Worthington-Built Auxiliaries



Economical Continuous Power—Diesel Engines, 150 to 2,640 hp . . . Gas Engines, 190 to 2,880 hp . . . Dual Fuel Engines, 150 to 2,640 hp.

WORTHINGTON
Engines

The Ten Leading Makes Of Vertical Turbine Pumps
Indicates Feature Is Standard

Standard Features	Worthington	Pump A	Pump B	Pump C	Pump D	Pump E	Pump F	Pump G	Pump H	Pump I
Seals above and below drain ports (oil-lubricated model)	✓				✓					
Wearing rings	✓				✓			✓		
Enclosed impellers	✓	✓	✓	✓	✓	✓		✓	✓	✓
Bronze bushings in bowl assembly	✓		✓	✓	✓	✓		✓	✓	✓
Flanged and bolted bowls on all sizes	✓						✓		✓	✓
Sand collars at both ends of bowl assembly (water-lubricated model)	✓	✓								
Grease-packed bottom bearing	✓	✓		✓						
Choice of oil or water lubrication	✓	✓	✓	✓	✓	✓		✓		

CHECK WORTHINGTON AGAINST THE REST

Only Worthington has all 8 vital design features as standard equipment.

Have you ever considered a vertical turbine pump for your industrial applications?

If you haven't, you may be missing a good bet.

For many years the vertical turbine pump was thought of as having only one application—deep well pumping. Recently, however, this efficient liquid handler has been given many other jobs, so that today we're not sticking our necks out when we say: it's an extremely *versatile* pump.

Let's take a look at the four inherent characteristics that make this pump really *versatile:*

1. THE DRIVE UNIT IS REMOTE AND SEPARATE FROM PUMPING ELEMENT. The pump always operates submerged. No priming. No expensive dry pits. No suction or NPSH problems.

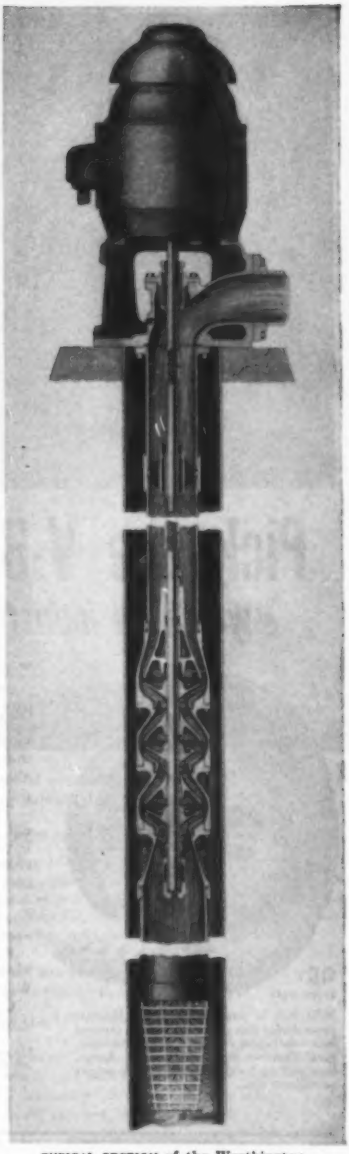
2. SPACE REQUIREMENTS AT A MINIMUM. Because of its vertical design, the vertical turbine pump takes less floor space than other types.

3. MECHANICAL AND HYDRAULIC FLEXIBILITY. Will operate with any type of drive. Discharge can be positioned to user requirements. Can be close coupled or several hundred feet long. Meets head and capacity requirements by varying the number of duplicate stages.

4. IT'S A SIMPLE MACHINE. Unidirectional thrust minimizes alignment problems. Easy maintenance, few moving parts, little friction, long life.

If you think a Worthington vertical turbine might be your answer to a pumping problem, or if you're not quite sure about it—we'd like to hear from you. Remember, Worthington, as the oldest manufacturer of pumping equipment, has the newest and broadest line of vertical turbine pumps.

Send complete data on your application mentioning capacities. Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Vertical Turbine Pump Division, Denver 16, Colorado; Succasunna, N. J



TYPICAL SECTION of the Worthington water-lubricated vertical turbine pump that gives most efficient pumping performance at lowest possible cost.

D.1.11

The World's Broadest Line Assures You The Right Pump For Every Job

WORTHINGTON

Vertical Turbine Pumps

Pick the V-Belt Sheave

which all industry likes best

QD
TRADE MARK

Split hub is clamped to shaft. Heavier taper-bored rim slides easily over tapered hub—no keyway obstruction on cone surface. Positive press fit on shaft. Large, long pull-up bolts also used as jack screws to remove rim.

Here's a 26-word description of the V-belt sheave that is used more than any other.*

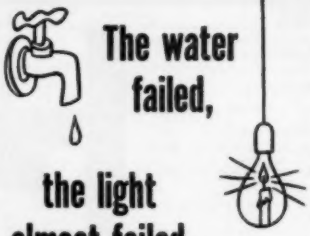
Two parts for easy handling—separately or together. Split hub and taper-mated rim make mounting easy. No re-alignment problem—clamped hub stays put while changing rims.

That's Worthington's QD—the original tapered cone-grip sheave that's preferred by men who have to install or change sheaves. The QD is *easy to get on, easy to get off, yet always tight on the shaft* —tighter than any other sheave on the market. Hubs for every bore—lower inventory cost.

For your machines, pick Worthington Multi-V-Drives with QD sheaves and Worthington-Goodyear EC Cord V-belts.

Complete range of stock sizes—prompt shipment from distributors everywhere.

**In addition to being one of the largest-selling sheaves, the popular Worthington QD design is licensed to many other sheave manufacturers. For your protection, dimensions are standardized to permit interchangeability.*



The water failed,

the light almost failed...

but the distributor "came through"

A hydro-electric plant, crippled by drought, was threatened with losing its franchise; was given 60 hours to bring its service up. Two Diesel engines were about to arrive when somebody remembered to order the V-belt drives.

A call to **Anderson-Crane Rubber Company**, Worthington distributor in Minneapolis, located four large D-section QD sheaves and 25 Worthington-Goodyear steel cable V-belts. These were rushed by car at night to the power plant, arriving just ahead of the engines. Within 24 hours, the plant was producing full power.

Once again, the Worthington distributor was *on the job*—with the needed supplies and the prompt service!

WORTHINGTON

THE GOOD RIGHT HAND OF INDUSTRY

POWER TRANSMISSION: sheaves, V-belts, variable speed drives

PUMPS: centrifugal, power, rotary, steam

AIR COMPRESSORS: water-cooled, air-cooled

Worthington Corporation, formerly Worthington Pump and Machinery Corporation

Multi-V-Drive Sales Division
Buffalo, New York

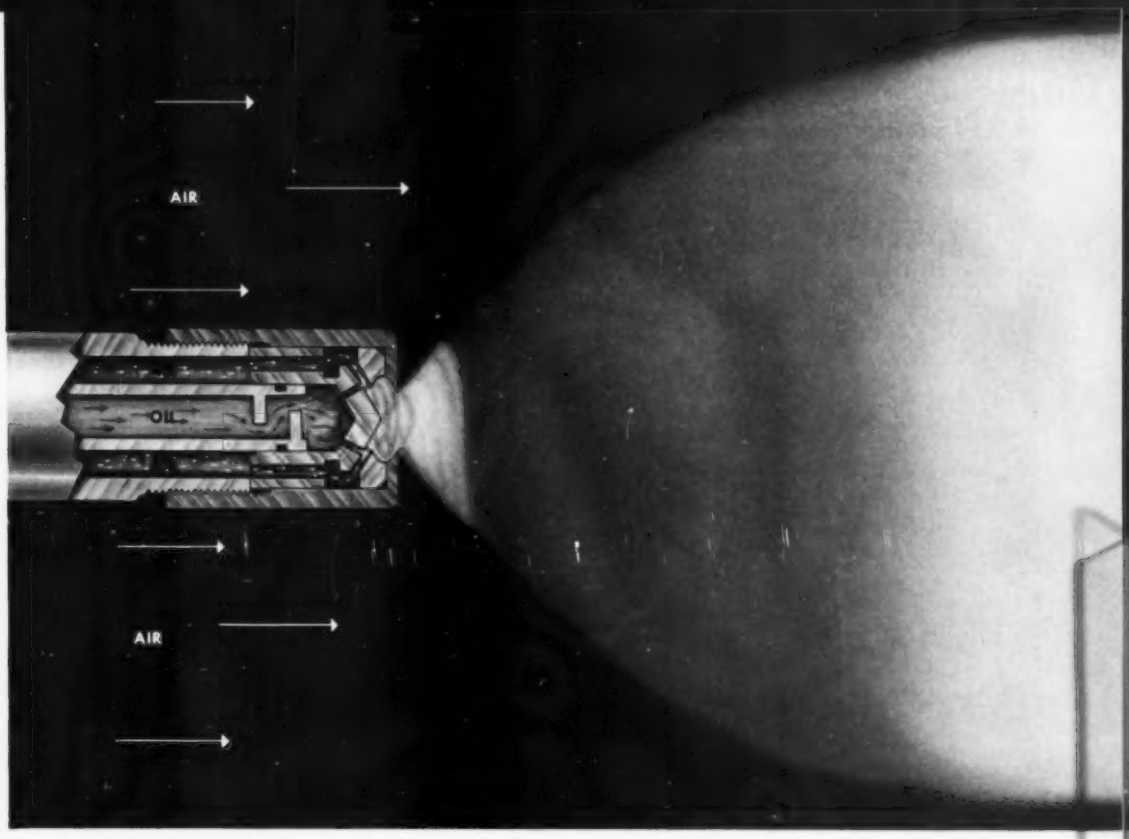
Send Bulletin V-1400-B7F on Worthington Multi-V-Drives.

Name .....

Company .....

Address ..... Zone .... State ..

MV.1.3



NOW—only Powermaster gives you VORIFLOW combustion!

LATEST DEVELOPMENT IN BURNER DESIGN REDUCES COSTS AND INCREASES BOILER EFFICIENCY

Here's what *Powermaster's* new VORIFLOW burner will do for you:

1. Saves fuel by providing infinitely variable combustion modulation in response to demand—with *full efficiency*—through wide range from 30% to 100% of firing capacity.

This means elimination of waste and maintenance headaches because of incomplete combustion. With the exclusive design of the VORIFLOW burner, tiny jets of compressed air pulverize every droplet of oil . . . projecting a fine fog of oil/air emulsion into the combustion area where it ignites and burns —immediately and completely. The VORIFLOW burner does away with outmoded mechanical spinning devices, globules of wasted oil, and gummy cleaning problems.

2. Slashes boiler maintenance costs.

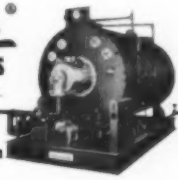
There are *no* moving parts to wear out • There is *no* cup to clean daily. Routine cleaning of the burner once a month is sufficient • There is *no* burner vibration to throw adjustments "out of whack" • Parts are made of stainless steel, brass, and beryllium copper—they will last indefinitely.

3. The combination burner permits rapid change-over from one fuel to another—light oil, heavy oil, or gas.

And when we say "rapid" we mean just that—the job can be done in four minutes. Modulating firing controls are ready to go into action at the flick of a switch. It isn't necessary to change the entire burner assembly. All you need to do to fire gas is to remove the oil nozzle.

Before deciding on a boiler for your plant, be sure to get the facts on the newest POWERMASTER with VORIFLOW combustion. Write for this catalog that gives you the entire story of the *Powermaster* packaged automatic boiler. Just drop us a line and we'll put one in the mail for you.

Powermaster®
PACKAGED AUTOMATIC BOILERS
In sizes to 500 HP; pressures to 250 psi.



ORR & SEMBOWER, INC. • Established 1885 • **1000 Morgantown Road, Reading, Pennsylvania**

TWO TERRY TURBINES IN RECORD NON-STOP RUN AT CITIES SERVICE

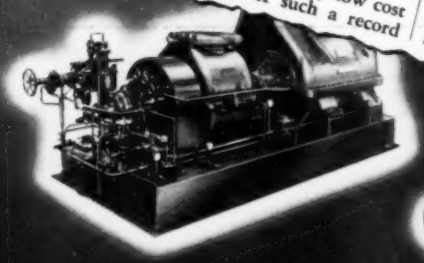
After 26 Months of Continuous Operation, Cost of Replacement Parts Only $78.00 for Each Turbine

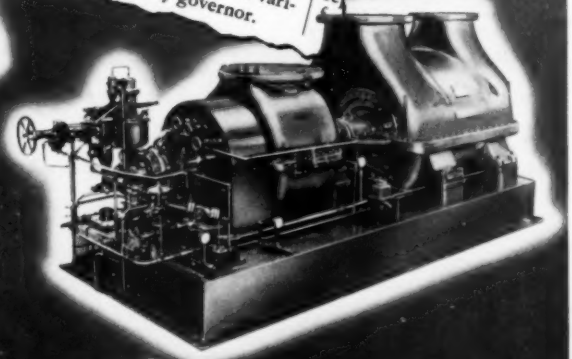
Two Terry turbines recently completed a record non-stop run at the East Chicago refinery of Cities Service Oil Company. Specially designed for driving air blowers on fluid catalytic cracking, they ran continuously *from initial start up*, day and night, for two years and two months. Throughout the entire run neither turbine suffered any noticeable reduction in efficiency.

On inspection, after shutdown, it was found that the only parts showing signs of wear were the shaft packing rings. These were replaced at a total cost of $78.00 for each turbine.

While this extremely low cost for repairs, after such a record run, could not have been anticipated, Cities Service had good reason to expect outstanding performance from Terry turbines. A four-year record of 216 Terry turbines at the Lake Charles refinery of this same company showed amazingly low maintenance costs. During this period, the yearly cost of replacement parts averaged only 1.4% of the initial investment.

The two turbines at East Chicago are rated 2450 horsepower at 5030 rpm. Each is equipped with a trip throttle valve, forced feed lubrication, and regulator for process control applied to a variable speed oil relay governor.





For more information about Terry multistage turbines, send for a copy of Bulletin S-146. No cost or obligation.

TERRY

THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TT-1193

STOP RUST! with RUST-OLEUM®

The Practical Coating!
Beautifies As It Protects!
In All Colors, Aluminum and White!

Cut maintenance costs. Apply RUST-OLEUM directly over rusted surfaces without removing all the rust! Just wirebrush and use sharp scrapers to remove rust scale and loose particles, then apply by brush, dip, or spray. Costly sandblasting and chemical precleaning are not usually required. Specify RUST-OLEUM for every rustable metal surface. Prompt delivery from Industrial Distributors in principal cities.

RUST-OLEUM CORPORATION
2471 Oakton Street, Evanston, Illinois

FREE SURVEY: A RUST-OLEUM specialist will gladly survey your rust problems. He'll make specific tests and recommendations. No cost or obligation. See Sweets for complete catalog and nearest RUST-OLEUM distributor, or write for literature on your company letterhead.

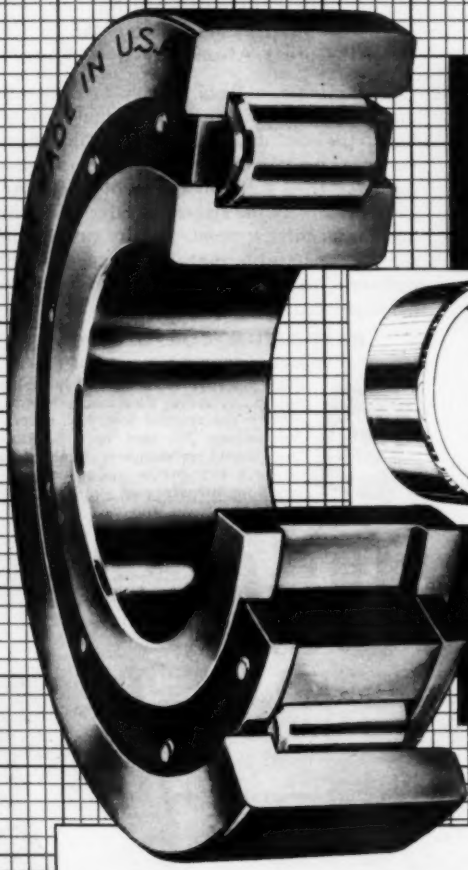
Protects Tanks, Girders Fences, Stacks, Metal Sash, Roofs, Buildings, Marine and Railroad Facilities

Stopping Rust with RUST-OLEUM 769 D.P. Red Primer

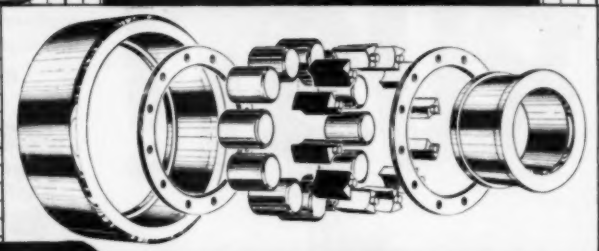
Look for this label. Be sure it's genuine RUST-OLEUM!

CLIP THIS TO YOUR LETTERHEAD
MAIL TO: RUST-OLEUM CORPORATION
2471 Oakton Street • Evanston, Illinois

- ☐ Have a Qualified Representative Call
- ☐ Full Details on Free Survey
- ☐ Complete Literature
- ☐ Nearest RUST-OLEUM Source



Versatile Radial Bearings



HYATT HY-LOADS

The BU-L type of Hyatt Hy-Load is a two part roller bearing having a single flanged, separable outer race. Rollers are retained by a conforming bar cage and flanges at both ends of the inner race.

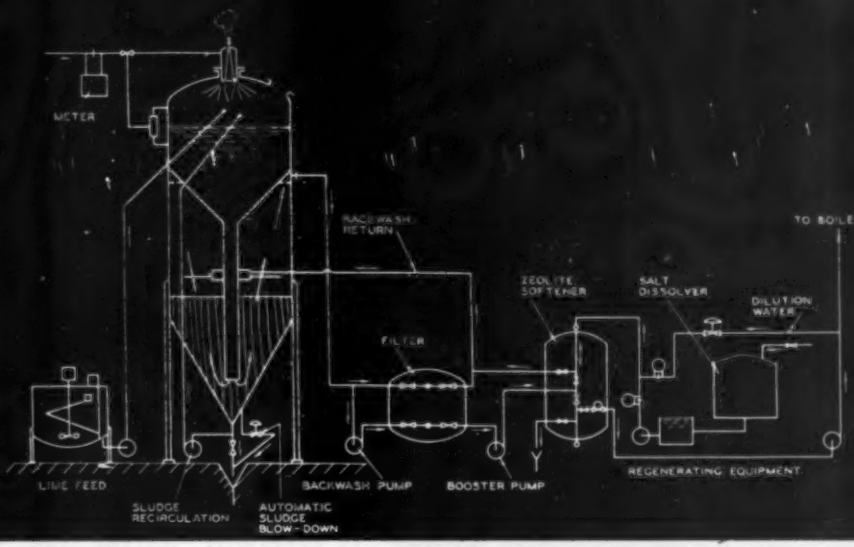
Race flange and roller end squareness, uniformity of roller dimensions and smooth operating surfaces are construction details that assure quiet, smooth, long-lasting performance at high speeds—capacity for carrying heavy loads.

The flanged races permit the BU-L Hy-Load Bearing to locate the shaft endwise and to carry an intermittent thrust load. In pairs, they can locate the shaft in both directions or accommodate light thrust from either direction.

You can take advantage of these and other features of the Hyatt line of radial roller bearings in the equipment you are designing or building. Look to your Hyatt Catalog or write for further information to Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

cochrane hot process zeolite water conditioner



1. saves chemicals
The zeolite softener uses salt instead of the more expensive soda ash and phosphates, bringing down the cost of chemicals considerably.

2. saves on capital investment The cost of adding zeolite equipment to a hot process installation is far less than the addition of an independent sedimentation tank and chemical feed for a two-stage phosphate process.

3. lower CO_2 in steam
The lower alkalinity resulting from using lime alone, plus the fact that this alkalinity is all carbonate, causes a reduction in CO_2 generated in the steam.

4. less operating attention The use of the zeolite softener with its simplicity of operation is an advantage which is enhanced by the longer periods between regenerations, due to the lower hardness of the hot process softener effluent.

5. less floor space and head room required
The addition of the zeolite equipment requires less floor space and less head room than that required for two stage phosphate equipment.

6. lower alkalinity The use of lime (or Dolomitic lime) as the sole reagent in the hot process means that the alkalinity can be reduced to about half that obtained with lime and soda ash.

7. only one chemical needed in the hot process It is generally possible to use a single reagent in the hot process, namely lime or Dolomitic lime, precipitating the bicarbonates and magnesium, leaving the remaining hardness to be removed by the more economical zeolite.

write for a copy of publication 4801, giving complete details on this new and economical process

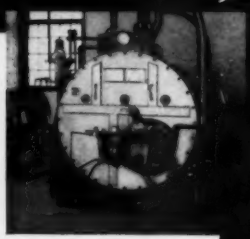
cochrane corporation • **3108 n. 17th st.** • **philadelphia 32, pa.**

in canada: canadian general electric co. ltd., toronto
in mexico: babcock & wilcox de mexico, s. a., mexico city
in europe: recuperation thermique & epuration, paris

COCHRANE CORPORATION 89 YEARS OF SERVICE 1863 - 1952

You are cordially invited to take a four-plant tour to inspect "packaged" EconoTherm Installations

. . . see how much OWNERS SAVE on fuel and labor with *Dutton* BOILERS



BIG RAILROAD SAVES $5,000 YEARLY WITH ECONOTHERM!

Talk first to roundhouse officials of one of America's greatest railroads*. One Dutton EconoTherm, used for roundhouse heating and hot water supply through *just the colder months each year* has made actual savings pegged at $5,000 per year! Automatically operated, it needs but a few minutes' checking daily. Former equipment required 24-hour-per-day attention.

* Name on request

STOKELY-VAN CAMP, INC., FINE FOOD PACKERS, LIKES ECONOTHERM'S FLEXIBILITY, ECONOMY

At Lakeland, Minn., stop at the sign of Stokely's Finest Foods and World Famous Van-Camp's Pork & Beans. H. H. Young, Chief Engineer, says: "The flexibility of Dutton Boilers fits well into our needs. We have a saving in boiler room labor . . . It is possible to operate with 50% less labor than previously . . . Particularly pleased with service rendered by your representatives."

ECONOTHERM UPKEEP IS ALMOST NIL AT THE CENTURY BRICK CO., MONROE, LA.

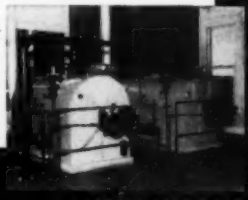
J. P. Humble, owner, can show you a gas-fired EconoTherm used around the clock, 5 or 6 days weekly, in curing sand lime brick and new, light building blocks. "In use since 1948 . . . upkeep cost practically nil . . . only shutdowns due to annual inspection or minor repairs of other machinery . . . could not make a more satisfactory purchase than a Dutton EconoTherm."

AT EVANSVILLE, INDIANA, THE WATER WORKS PLANT SUPT. SAYS "WELL PLEASED!"

And there are hundreds of others!

To get more facts first-hand, why not talk to Dutton owners near you? Contact Dutton — or ask your nearby Dutton Representative for the location of installations you can tour yourself! When you write, ask for EconoTherm Bulletin EC-100 B.*

* See Yellow Pages in Phone Book.



CHECK FIRST with *Dutton*

Dutton BOILERS

DIVISION HAPMAN-DUTTON COMPANY

KALAMAZOO, MICHIGAN • BOILER BUILDERS SINCE 1880

FOUR TYPES — SIZES FROM 5 H.P. UP

SEE THE INSIDE STORY OF WHY

Dayton V-Belts last for YEARS!

Exclusive Dayton 327-V blend of natural and synthetic rubbers. Blended for tension —stretches easily and returns to original position instantly. Eliminates distortion and heat build-up.

Every cord has thousands of continuous filaments of high-tenacity rayon! And the complete surface of each cord is fully rubber coated by Dayton's new *Thoro-Bonding* process. Result: high resistance to fatigue . . . great flexibility . . . high tensile strength!

Special compound (812-V) for compression section of belt only. Compresses with minimum "prodding"* of cords during flexing —maintains crosswise rigidity.

*The upward thrust of the compression section against the cords.

All-weather, rubber impregnated cover, made of costly, "Hi-Twist" fabric, for better flexing, longer wear. Proper bias angle maintained at all times for easy flexing.

Find out how much money this better belt can save you!

Ask your Dayton Distributor to give you the complete Inside Story of Dayton Thorobred Belts. His complete line of belts solves every drive problem! You'll find his name listed under "Belting" in your telephone directory.
Dayton Rubber Company, Dayton 1, Ohio.

Dayton Rubber

Since 1905

WORLD'S LARGEST MANUFACTURER OF V-BELTS

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When you need a good general-purpose alloy —try Monel!

Expanding Monel tube into the head of a high-pressure feed-water heater. Here's an example of where Monel's high ductility combines with its other characteristics to make it the perfect metal for the application.

Today, even the most "up-to-the-minute" metallurgist finds it hard to keep pace with all the alloys and their many applications.

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That alloy is Monel®!

Monel is a solid solution alloy with good strength (twice that of brass and equal to structural steel). And it retains its strength at operating temperatures of 700-800° F.

It has good resistance to corrosion, cavitation and erosion. And its high ductility provides good workability. It is supplied in all general mill forms as well as in castings.

You can get some idea of how useful Monel can be when you consider just one application –high-pressure feed-water heater tubes–where it proves to be the *only* answer.

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Monel meets *all* these requirements!

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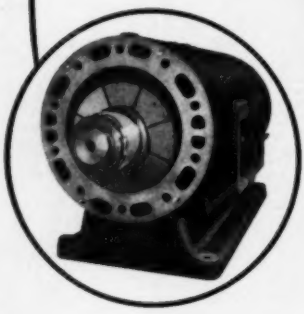

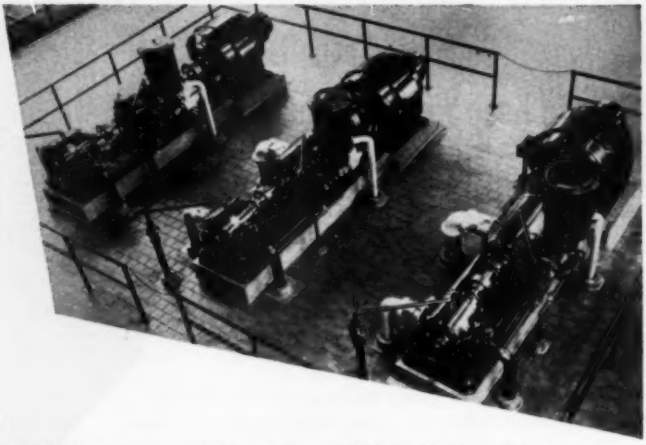

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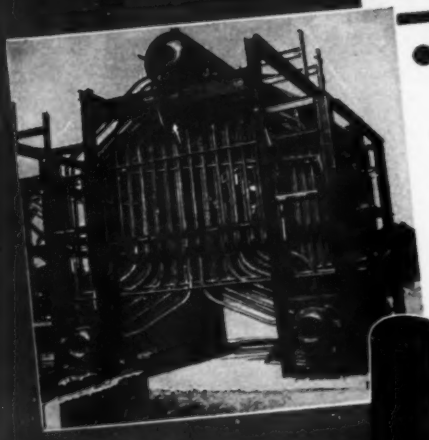
C-215

UNION
"H" TYPE
STEAM GENERATOR



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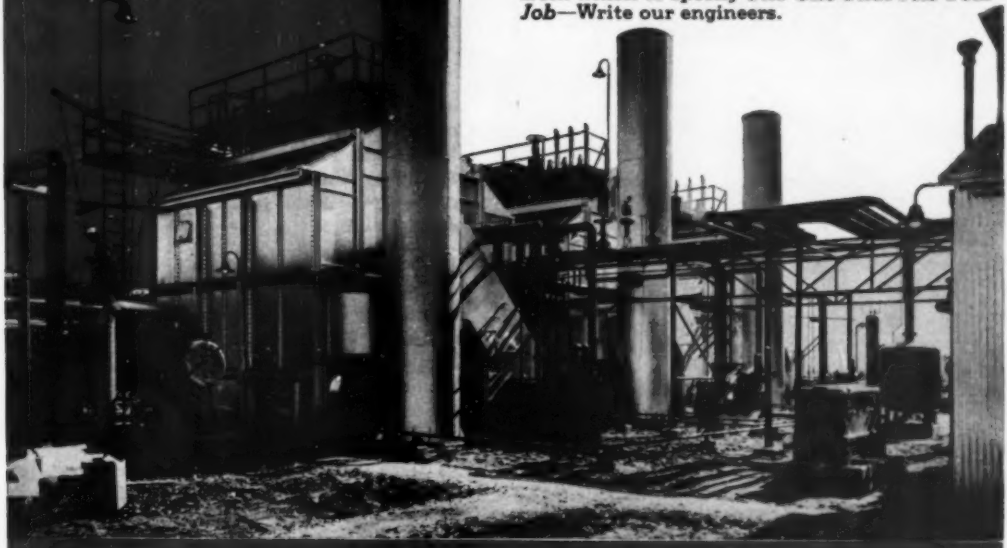
❷ Drum and tube arrangement symmetrical . . . a tube bank on each side forming an integral water cooled furnace. No headers . . . No handhole plates required.

❸ Superheater on one side only provides (patented) simplified superheat control over a wide load range for all fuels and varying excess air. Automatic adjustment of boiler outlet dampers controls gas flow across superheater.

❹ Design accommodates any fuel or firing method for any desired capacity or pressure.

There are 13 basic Union boiler designs from which to specify *The One That Fits Your Job*—Write our engineers.



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BOILERS • PROCESS EQUIPMENT • FABRICATED STEEL

Dirty Water can't "Shut-down"...

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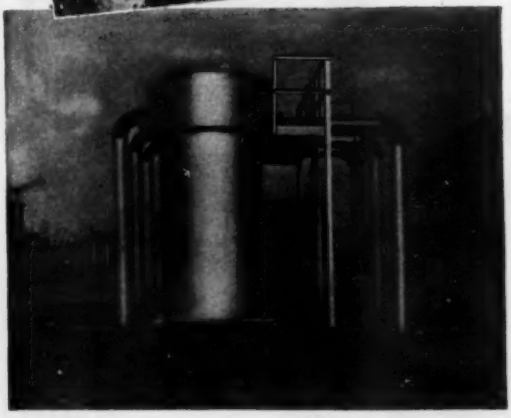
film type exchangers

(Condensers—Coolers—Evaporators)

Patent Nos. 1,935,270 - 2,057,597 - 2,424,441



River water, well water or brackish water are all alike to this exchanger *because it can be cleaned* while in operation! The water distributing ferrules need only be removed successively for the cleaning brush or tool whereby the tubes receive additional water which sluices away the dislodged dirt.

Vogt Film Type Exchangers are operating with real economy of first cost, operation and maintenance in power, petroleum, and chemical industries. They serve as Jacket Water Coolers, Feed Water Heaters, Hydrocarbon Evaporators, Sulphuric Acid Coolers, and Sulphur Dioxide Condensers, and can be designed to cool or heat any liquid and to condense or evaporate any fluid.

TOP: *Four units at Newton Falls, Ohio Municipal plant cool water for diesel engines and a lubricating oil cooler.*

BOTTOM: *Jacket Water Coolers serving engines of 7,300 HP in the compression plant of a Western Oil Refinery.*

[Bulletin HE-7 describes typical installations of Vogt Film Type exchangers and is available upon request.]

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

QUAKER *Production-eered** BELTING

ON THE DRIVE FOR 10 YEARS ...AND LIFE JUST BEGINS

QUAKER TRANSMISSION BELT

"HOLDS UP TWICE AS LONG ON MAIN DRIVE AS ANY OTHER BELT"

On the job more than 10 years—six of them running day and night. Delivery peak power, production and performance . . . demanding virtually no maintenance at all! That's the powerful record built up by this tireless Ironsides Endless transmission belt "Production-eered" by QUAKER for a Southern mill.

Through the years, this faithful QUAKER belt has harnessed the horsepower of this big main drive . . . delivering smooth, silent, positive power. And still no signs of wear or tear! Says the production superintendent: "We find Quaker belting holds up twice as long as any other belting. We are now using a belt that's as good as the day we put it on . . ."

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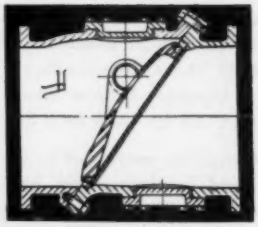
Exclusive TILTING DISC *Check Valve*

Nothing can "unseat" the disc-ring of this valve from its *drop-tight* contact with the body-ring . . . because clearance at the hinge-pins means that this contact is *complete.* There is no sliding action, consequently no wear, no leakage. And the pivoted disc is cushioned to an easy, silent closing . . . without slam . . . in installations that don't have unusual piping arrangements.

What's more, hydraulic laboratory tests at a top engineering school prove that the specially designed disc and streamlined valve-body reduce head loss as much as 80% under conventional swing-type check valves. See the graphs of these tests . . . and illustrations of the unique construction features of Chapman Tilting Disc Check Valves . . . in Catalog No. 30 (yours for the asking). *Write.*



Cross-section of the Chapman Tilting-Disc Check Valve. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

THE CHAPMAN VALVE MFG. CO.

INDIAN ORCHARD, MASSACHUSETTS

Sludge . . . a water formed sedimentary deposit which may include all suspended solids in the water. Sludge usually does not retain its physical strength when removed, but it may bake in place and become hard and adherent . . . (Ref. ASTM D 887, D 933).

Use DREW POWER CHEMICALS

Tube failure, expense and inconvenience . . . even plant shut down . . . frequently results from baked-on sludge. Sludge often resembles scale and frequently causes the same troubles. It's the function of every good boiler water treatment to prevent the adherence of sludge as well as scale.

So we say, "Draw a Bead on Boiler Sludge, Mr. Engineer." Call in the Drew engineer. The water samples and operating data that he obtains in your plant will be thoroughly analyzed in the Drew Laboratories, and you'll be given specific recommendations for corrective Drew treatment. Furthermore, your Drew engineer will give you frequent and continuous help in your plant.

Thorough investigation, proper treatment, and frequent service have made Drew one of America's fastest growing water treatment companies. Consult the nearest Drew engineer or write for information.

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The TRANE Projection Heater handles high ceilings, craneways. For ventilation, use the Torridor, or the TRANE Powered Ventilating Heater. Doors and windows can be blanketed with a TRANE Horizontal Unit Heater. For lobbies there's the TRANE Force-Flo Heater. If gas is available there's the TRANE Gas Fired Unit Heater.

These six TRANE Unit Heaters, together with two exclusive patented diffusers, enable you to find the right combination for *your* factory heating problem.

Matched for perfect service with TRANE Unit Heaters are TRANE Steam Specialties; bucket, float and thermostatic traps for high and low pressures.

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for wiring in action

only **SEALTITE** ELECTRICAL CONDUIT

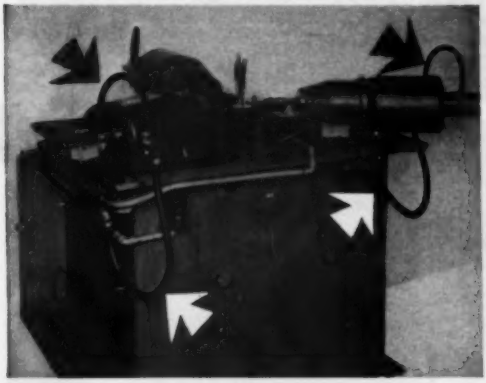
is **flexible** as **rubber**

strong as **steel**

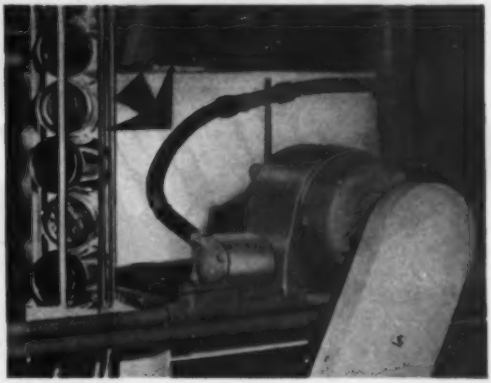
and **liquid-tight**

Flexible Sealtite can be used wherever there is vibration, where connections must move, or where installations are cramped and conduit must bend. Tough design problems become simple with Sealtite.

Liquid-tight Sealtite's heavy synthetic jacket protects wiring from liquids, cutting oils, chemicals and steam. Though flexible, Sealtite's steel core guards wiring from crushing and impact.



Here Sealtite protects wiring between the drill unit motors and control boxes on this Govro-Nelson Automatic Drilling Machine capable of drilling 1700 holes an hour.



Sealtite protects conveyor motor wiring at Van Camp Sea Food Co., Inc., Terminal Island, Cal., packers of famous "Chicken of the Sea" and "White Star" tuna. All mobile and cramped-space wiring is safe in Sealtite.

Sealtite* saves money. It can be installed in a fraction of the time it takes to install regular conduit. For temporary installations—such as on construction jobs and processing plants—Sealtite is quickly installed and easily relocated. For permanent installations—Sealtite improves appearance and avoids expensive rewiring. Sealtite can be cut as you need it. It comes in all standard electrical fitting sizes.

To find out how Sealtite can solve your need for a strong, flexible conduit, see your regular electrical supplier. Ask for Bulletin C-201 fully describing Sealtite or write for your copy directly to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company Ltd.

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for **flexible, liquid-tight** electrical conduit..specify

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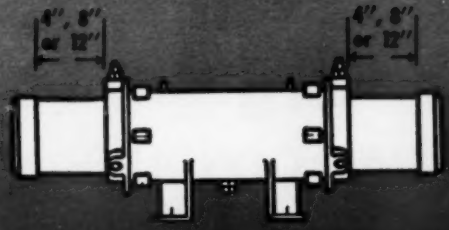
AN ANACONDA PRODUCT

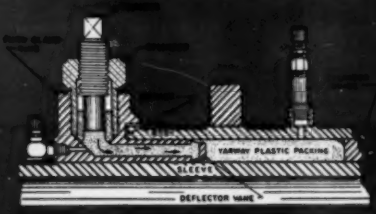
YOU NEED FEWER JOINTS



With Yarway Gun-Pakt slip-type expansion joints you need fewer joints than with other types, because each sliding sleeve has a traverse of 4", 8" or 12" . . . maximum expansion being 24" for a double-end joint.

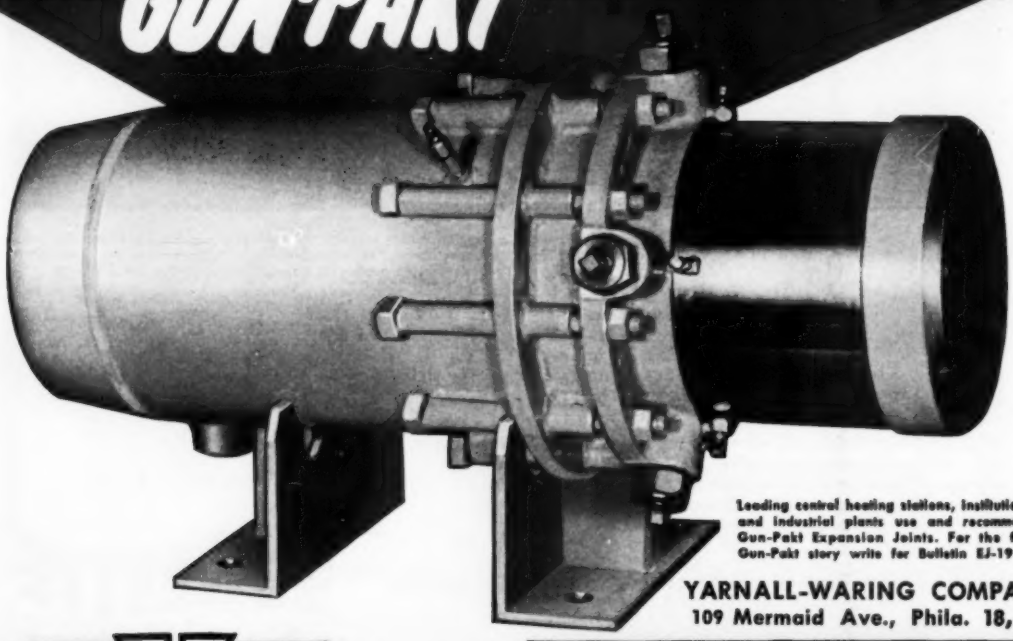
For example, one single-end Yarway Gun-Pakt joint with an 8" traverse is all that is needed for a 200 ft. run of steel pipe carrying saturated steam at 350 psi.

AND LESS MAINTENANCE



No need for shutdowns. Yarway Gun-Pakt Joints are serviced under full expansion pressure. Just insert a plug of Yarway plastic packing, twist a wrench and the job is done. Maintenance and preventive maintenance are simple!

with GUN-PAKT expansion joints



Leading central heating stations, institutions and industrial plants use and recommend Gun-Pakt Expansion Joints. For the full Gun-Pakt story write for Bulletin EJ-1912.

YARNALL-WARING COMPANY
109 Mermaid Ave., Phila. 18, Pa.

YARWAY GUN-PAKT EXPANSION JOINT

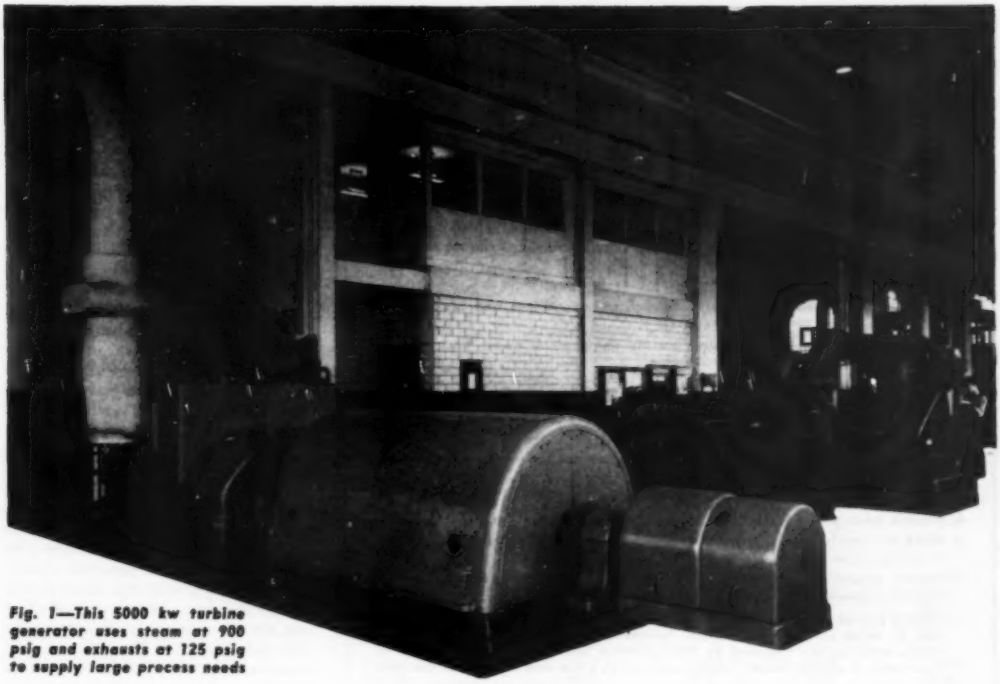


Fig. 1—This 5000 kw turbine generator uses steam at 900 psig and exhausts at 125 psig to supply large process needs

PURCHASED VS GENERATED POWER

Many installation reviews describe the advantages of by-product generation of electrical power. This article gives the basic factors involved and shows, by examples, how to determine if private power generation is economically feasible for any particular application

H. CARL BAUMAN, P.E.
Chief, Electrical Engineering Division
American Cyanamid Company

NOT TOO MANY decades ago, there was a time when a choice of "purchased vs generated power" did not exist for industry. Public utilities served only heavily populated areas not always ideal for growing industry. The electric power industry was young and its transmission systems, limited by voltage considerations, had not been extended into virtually all parts of the country as at present. Central stations were small on today's standards and turbine throttle pressures were still in the 250 lb class.

There was seldom a choice for basic industry. It generated its electric requirements in areas where power was not available and it was able to compete favorably with the utilities in areas where electricity could be purchased.

World War II and the years which followed saw the expanding public utilities take giant strides to keep just ahead of phenomenal industrial growth. Between 1940 and 1951 the electric power companies expanded twofold, with connected capacity going from 39,927,000 to 75,400,000 kw, generation from 141,837,000,000 to 370,536,000,000 kwhr per yr. In contrast, total industrial generating capacity increased only 25 per cent between 1940 and 1951, going from 11,035,000 to 13,391,000 kw. Production increased

FACTORS FAVORING PRIVATE ELECTRICAL POWER GENERATION

1. Complete independence needed from outside sources. Valid only for processes which cannot be shut down unexpectedly for any reason. In extreme cases private power generation is supplemented with stand-by purchased power.
2. Lack of sufficient power in area.
3. Poor utility transmission or distribution facilities resulting in frequent outages due to lightning, storm or line faults.
4. Assurance of sufficient power supply at all times, particularly if shortages occur.
5. Basic industries having large power requirements (100,000 kw or more) capable of amortizing over long periods of time (20 yr or more) may compete favorably with local public utility.
6. Availability of assured amounts of water power (not common).
7. Availability of cheap by-product fuels such as natural gas and certain coals (true of a limited number of processes).
8. Large requirement of low pressure process steam which makes back pressure electric generation economically desirable.

FACTORS FAVORING PURCHASE OF ELECTRICAL POWER

1. Availability of sufficient power facilities, lines and services.
2. Small condenser generating plants cannot compete with the large central stations.
3. Private generating station requires larger operating force per kw of capacity than total of utility generation, transformation, transmission and distribution crews.
4. Possible labor problems in a field not directly allied with products manufactured.
5. Need for complete stand-by generating units in continuous operation plants adds to cost of manufacturing electricity.
6. Rapidly expanding plants may find they cannot erect generating capacity in time to serve a specific increase in plant process equipment.
7. Capital required for generating plant construction may be used to earn a higher rate of return in company's normal business. As an example, public electric utilities earnings are regulated by Public Utilities Commissions to a maximum of 6 per cent of capital. Many industries are earning two and three times this rate.
8. When process steam requirements are small compared with total electric power usage, low pressure boilers and purchased power are economically justified.

from 38,070,000,000 to 59,533.000,-000 kwhr annually.

The war-born need for enormous amounts of power saw electric utilities across the nation extend transmission lines to interconnect with each other in gigantic networks to overcome ever-impending power shortages. Advent of the efficient unit generating plant of single 1,000,000 lb per hr, 1400 psi, 1000 F class steam generators supplying 100,000 kw turbine generator sets assured America's continuing power supply at unit costs barely greater than that of the early decades, despite a sev-eralfold rise in material and labor cost.

In the face of such advances by electric public utilities, small industry still finds no choice economically; it generally can purchase its power requirements from efficient producers more cheaply than it can afford to generate.

Plants With a Choice

There is, however, a sizable segment of heavy industry, such as chemicals, paper, textiles, steel and petroleum, which still has an economic choice on whether to buy or generate electric power for its new or expanding plants.

The choice is seldom an arbitrary one. On the contrary, it involves a careful study of many physical and economic considerations. Factors favoring private generation and those favoring purchase of power are summarized in the box at the left.

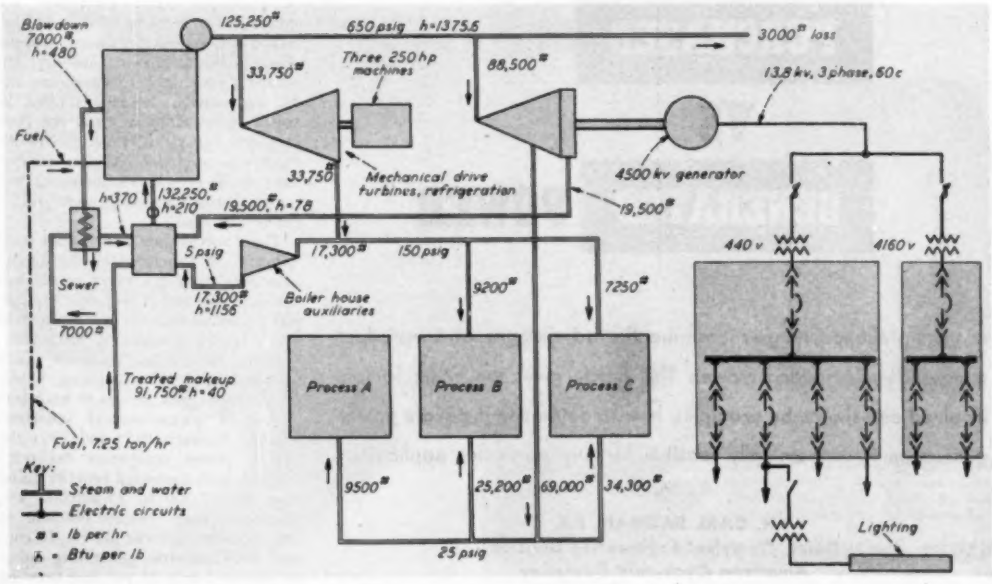


Fig. 2—Heat balance diagram, Plan A, for a chemical plant which uses a comparatively large amount of process steam and generates electric power on a by-product basis. Heavy loads and auxiliaries are turbine driven where possible

These are *qualitative* arguments for generated or purchased power. A *quantitative* analysis is necessary to economically justify a decision on whether to generate or buy electricity.

Typical Examples

Assume two industrial plants; a chemical plant and an ore cleaning plant. The chemical plant uses a total of 4500 kw in electric drives, 750 hp in mechanical refrigeration and a total of 85,450 lb per hr of steam for process heating.

The ore plant has similarly an electric load of 4500 kw, an air compression load of 750 hp, but no steam load other than a small amount of space heating.

Table 1 shows basic operating data for both plants. In Plan A, the chemical plant generates its own power. In Plan B, all electric power is purchased. In Plan C, the ore plant generates power, and Plan D shows operating data when the ore plant buys all power.

Both plants are located in an area where coal at $8.00 a ton, having a heating value of 12,000 Btu per lb, is the available fuel.

Before an economic comparison can be attempted, it is necessary to prepare a heat balance of all forms of energy to be used in the plant to enable the selection of drives and steam generating pressures and to determine most efficient energy utilization.

Fig. 2 shows a heat balance for the chemical plant, Plan A.

The 4500 kw of electric energy is made up in large part of numerous small chemical pumps, agitators, screw conveyers, and weighing devices for which electric motors are the obvious drive. The remainder of the electric load is comprised of motors for water pumps, for which steam drives are impractical, and the plant lighting load.

There are also three 250 hp refrigeration machines. Choice of a drive for these machines will depend on the requirements for a proper balance of the plant's energy needs.

Past experience has shown that a 600 psi boiler pressure at about 750 F total temperature for a plant of the size under consideration is a good se-

TABLE 1 — OPERATING DATA

Plan	A, process steam plus generated power	B, process steam plus purchased power	C, no process steam; power generated	D, no process steam; power purchased
Steam and make-up, lb/hr				
650 psig	125,250	—	68,800	—
155 psig — total	33,750	99,950	10,000	—
155 psig for process	16,450	16,450	—	—
25 psig for process	69,000	69,000	—	—
5 psig	17,300	12,900	10,000	2,800
Condensate	19,500	—	57,000	—
Losses	3,000	2,500	1,800	180
Make-up water	91,750	84,950	7,300	190
Electricity				
Kw demand	4,500	4,500	5,250	5,250
Kwhr/yr (100% load)	36,000,000	36,000,000	42,000,000	42,000,000
Cost/kwhr	—	$0.009	—	$0.009
Coal				
Btu/lb	12,000	12,000	12,000	12,000
Cost/ton	$8.00	$8.00	$8.00	$8.00
Consumption ton/yr	58,000	40,600	31,800	800

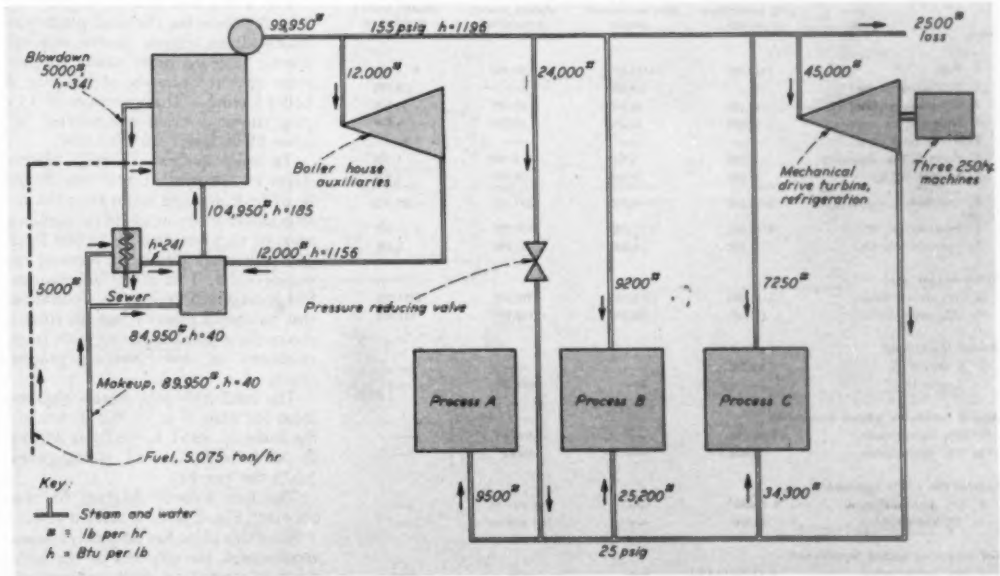


Fig. 3—Heat balance diagram, Plan B, with the same process steam requirements as in Fig. 2 but using purchased power.

Steam not furnished by refrigeration turbine must come from reducing valve where pressure drop causes a high power loss

lection when back pressure mechanical or electrical generation is indicated. To obtain 600 psig at turbine throttles, a boiler drum pressure of 650 psig has been selected for the example.

Balance With Generated Power

Fig. 2 shows the chemical plant balanced for Plan A. By selecting mechanical drive turbines operating at a 150 psig back pressure for the refrigeration machines, sufficient steam is obtained for all 150 psi process requirements, the boiler house turbine driven fans and boiler feed pumps. The 5 psig back pressure steam from the auxiliary turbines is then utilized for feedwater heating.

Use of turbines in this fashion results in power production for refrigeration drives and boiler house auxiliaries at the expense of a little over 200 Btu per lb in the steam, with the remaining 1150 Btu per lb consumed as heat in process or in heating boiler feedwater. This is no doubt the cheapest power that can be provided for this equipment.

To obtain the plant's 25 psig process requirements an automatic extraction turbine is selected for the turbine generator set.

This turbine has throttle conditions of 600 psig and 750 FTT, a 25 psig extraction port and a condenser section operating at 2.5 in. of mercury. The 69,000 lb per hr of steam for process is extracted at 25 psig, while 19,500 lb per hr goes to the condenser. The turbine so operated produces 4500 kw at the generator terminals. All condensate is returned to the boiler feedwater system.

The extraction turbine provides a certain amount of flexibility of operation. If process steam requirements fall off, required electric generation can be made up by passing more steam automatically to the properly designed condenser section of the turbine.

The resulting heat balance indicates a total steam generating capacity of 125,250 lb per hr of 650 psig steam, water make-up requirements of 91,250 lb per hr, and a fuel consumption of 7.25 ton per hr of coal calculated for a boiler efficiency of 83 per cent.

TABLE 2—INSTALLED COST OF VARIABLE INVESTMENTS

Item	Plan / Equipment	A, process steam plus generated power	B, process steam plus purchased power	C, no process steam; power generated	D, no process steam; power purchased
1	Steam generator plus auxiliaries and building	$750,000	$450,000	$400,000	$ 15,000
2	Turbine generator, auxiliaries, switchgear and building	350,000	—	400,000	—
3	Main substation	—	75,000	—	85,000
4	Pumping station and water softening	40,000	20,000	35,000	5,000
5	Coal handling and ash disposal	40,000	30,000	25,000	5,000
		$1,200,000	$575,000	$860,000	$110,000
6	Construction, engineering, overhead, supervision, insurance, etc.—20%	240,000	115,000	170,000	22,000
Total investment		$1,440,000	$690,000	$1,020,000	$132,000

TABLE 3—OPERATING COSTS BASED ON 8000 HR PER YR

Item	Plan	A, process steam plus generated power	B, process steam plus purchased power	C, no process steam; power generated	D, no process steam; power purchased
1	Fuel	$464,000	$324,800	$254,400	$ 6,400
2	Purchased power	—	324,000	—	378,000
3	Labor, supervision	60,000	40,000	60,000	10,000
4	Maintenance repairs	50,000	35,000	45,000	5,000
5	Water (in 1 or 2)	—	—	—	—
6	Property tax, insurance	12,000	5,750	8,500	1,100
7	Interest (3.5%)	42,000	20,000	30,000	3,900
8	Cost before depreciation	$628,000	$749,500	$397,900	404,400
9	Depreciation 10%	$144,000	$ 69,000	$102,000	$ 13,200
9a	Depreciation 5%	72,000	34,500	51,000	6,600
Total annual cost					
10	10% depreciation	$772,000	$818,500	$499,900	$417,600
10a	5% depreciation	698,000	784,000	448,900	411,000
Added investment					
11	A over B	$750,000	—	—	—
11a	C over D	—	—	$888,000	—
Annual return on added investment					
12	10% depreciation	$ 46,500	—	None	—
12a	5% depreciation	86,000	—	None	—
Federal tax (50% assumed)					
13	10% depreciation	$ 23,250	—	Tax saving	—
13a	5% depreciation	43,000	—	Tax saving	—
Net return on added investment					
14	10% depreciation	$ 23,250 (3.1%)	—	—	—
14a	5% depreciation	43,000 (5.7%)	—	—	—

Fig. 3 is a heat balance diagram for Plan B, where the chemical plant purchases all its electric power requirements. Since no plant steam requirement exceeds a pressure of 150 psig, a boiler having a drum pressure of 155 psig saturated steam was selected because of its lower installed cost.

To make up total 25 psig process steam requirements, the 45,000 lb per hr of back pressure steam from the refrigeration mechanical drive turbines must be supplemented by 24,000 lb of 155 psig steam through a pressure reducing valve. This is not an economical arrangement and is an indication that purchased power is not the correct choice for a plant requiring such large quantities of low pressure process steam.

The total 155 psig steam requirement for Plan B is 79,950 lb per hr, the make-up water necessary is 84,950 lb per hr and the fuel consumption 5.075 ton per hr.

The heat balance diagram for the ore plant, Fig. 4, is for generated power.

Since this plant has no process steam requirement, the economy of the back pressure mechanical drive turbine cannot be utilized for the three 250 hp air compressors. These have therefore

been lumped with the 4500 kw plant load to make a total generation requirement of 5250 kw.

For a load of this magnitude, experience indicates the choice of a 650 psig, 750 F steam generator. Total steam generated at 650 psig is 68,800 lb per hr; total treated water make-up is 3.975 ton per hr.

Plan D requires no heat balance diagram because all electric power is assumed purchased and only a 15 psig heating boiler is required for plant heating purposes.

Table 1 shows all the operating data for the four plans developed from the heat balance diagrams.

Variable Investments

The next step in evaluating the four schemes is to estimate the variable investments in each plan as shown in Table 2.

No spare equipment has been included in these costs since this would penalize generation more than purchased power. In most plants, extra cost of stand-by capacity could not be justified unless the plant's process is of such nature that it could not afford an unplanned shutdown.

Table 2 shows that investment for generated power, Plan A, is more than twice Plan B. Plan C costs about eight times as much as Plan D. These differences in first cost are significant where capital for new plants is limited.

Annual operating costs are shown in Table 3. For simplicity's sake, an operating schedule of 8000 hr per yr and an electric load factor of 100 per cent use of demand has been assumed.

At such a load factor and for the magnitude of electric power consumption involved, a unit rate of 9 mills per kwhr of electricity is not uncommon in areas where industrial coal costs $8.00 per ton. This rate has been assumed in computing annual costs of purchased electricity.

To more fully illustrate some of the principles of generated versus purchased power, two depreciation periods are assumed; 10 and 20 yr.

Table 3 shows that on a 10 yr depreciation basis there is an annual saving of $46,500 for generated over purchased power for the chemical plant. After federal taxes, assumed at 50 per cent, this represents a return on investment of 3.1 per cent, too small to be interesting to the chemical industry. On a 20 yr amortization basis the return would be 5.7 per cent. This rate of return would be acceptable to many industries which require a certain assurance of guaranteed power over the longer period.

In other basic industries which can look ahead to more than a 20 yr amortization program, generation under the assumed conditions is recommended.

If the assumed chemical plant were located in a natural gas area, the combination of lower first cost for outdoor plant construction and lower fuel cost would tend to increase the rate of return earned by generating electric power. The present high federal tax rate is another deterrent to high net earnings on industrially owned generating plants even with the thermodynamically economic advantage of back pressure operation.

Table 3 shows that there is a net loss of $82,300 per annum for the ore plant generating electricity, on a 10 yr depreciation plan, over purchased power as in Plan D.

For a 20 yr depreciation program the loss is $37,900 annually. In fact, the amortization period would have to be approximately 50 yr before annual operating costs of generating electricity under Plan C would equal operating costs when purchasing electricity as under Plan D.

Conclusions

It is safe to conclude that industrial generation of electric power can be justified on an economic basis when process steam requirements are equal to or greater than that required to produce all the plant's electric demands on a by-product basis. It is generally difficult to justify generation of moderate amounts of electric power on a condensing basis in plants where little or no process steam is required.

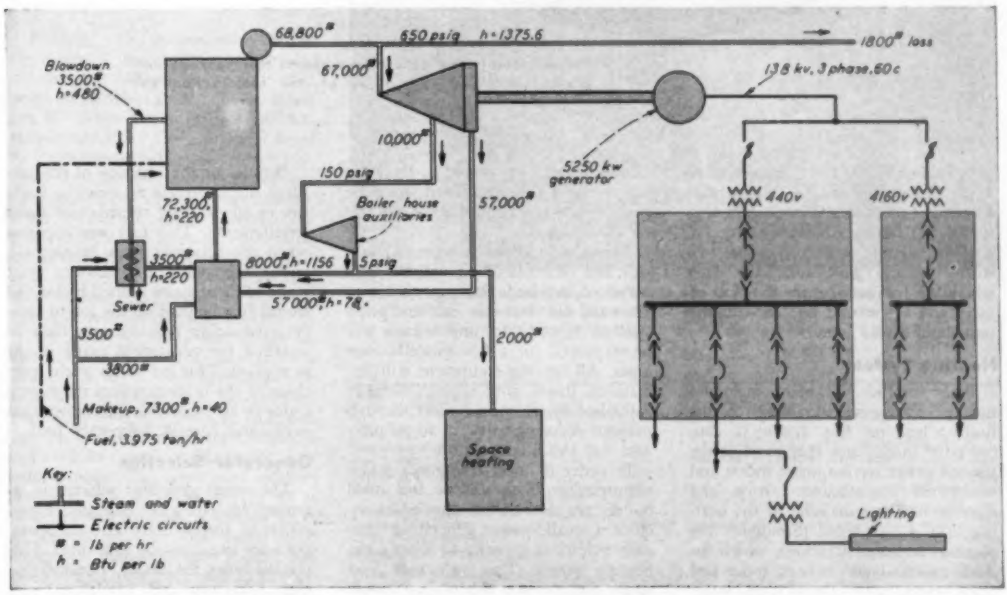
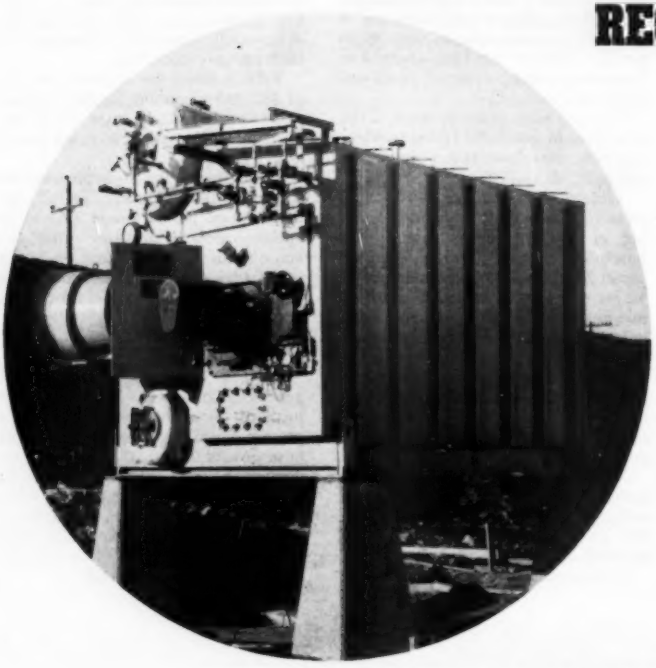


Fig. 4—Heat balance diagram, Plan C, for an ore plant that uses no process steam but generates its own electric power.

Cost of generating equipment and higher man-hours per kwhr are needed in evaluating its worth for continuous processes

PACKAGE STEAM GENERATOR MEETS DUAL SERVICE REQUIREMENTS

EDWARD F. SHEEHAN
General Superintendent, Construction Division, Engineering Department, Philadelphia Electric Co.



Philadelphia Electric Co. is now installing a factory-assembled generator to provide steam for construction at the new Cromby station. When the plant is complete, the boiler will be moved to a permanent location in the station and serve as emergency supply for the heating system

The structural steel base that supports this package unit greatly simplified installation at the construction site

ON MAY 29, 1951, construction was started on the Philadelphia Electric Company's new generating station at Cromby, Chester County, Pa. This installation will consist of two steam turbine generators, the first scheduled for service in the fall of 1953 and the second due for completion about a year later.

Heating System

Plans for the new plant include a hot air heating system. Most of the heating load on this system is concentrated in one area that contains the general office section, main locker and washroom, maintenance shop and storeroom. The remainder of the heating load is distributed throughout the plant in scattered locations, which include miscellaneous offices, toilet and utility rooms, main control room, water treating room, ash unloading room, and certain sections of the coal crusher building. All areas served by the heating system will be ventilated while the main office and control room will be air conditioned.

For most locations, mixtures of outside and recirculated air will be tempered in standard heating-ventilating units and distributed by duct and grille systems. In addition, unit heaters will be employed for a few miscellaneous areas. All heating equipment will operate on steam, with supply normally furnished by the main boilers through pressure reducing valves at 50 psi pressure and 350 F temperature.

In order to meet emergency steam requirements in the event the main boilers are shut down, the plans include a small steam generating unit with sufficient capacity to supply the heating system. This unit will feed steam directly into the piping system at the pressure normally maintained for operation of the heating units.

Because of the isolation of the new plant site, there are no existing facilities to take care of construction steam requirements. This fact was apparent when specifications were in progress, and consequently provisions were made to incorporate a small boiler that would first be used on the job to satisfy construction requirements, then be installed for permanent usage in the new plant. This led to an early purchase of the heating system steam generator to accommodate all construction needs and furnish temporary heat.

Generator Selection

The steam generator selected is arranged for firing oil only under condition of forced draft, and all operations are automatically controlled. This unit includes the boiler, furnace, casing, refractory and insulation, soot blowers, water column, external valves and boiler piping, feedwater regulator,

motor driven forced draft fan, windbox, fuel oil burner and firing controls. In addition, the system has a detached combination fuel oil heating, straining and pumping assembly, and a detached main control panel.

Boiler Construction

The main boiler section consists of an upper steam drum and a lower water drum connected by a bank of tubes, all on one side of the furnace with water wall tubes on the opposite side and rear walls. These side water wall tubes also form the roof of the furnace by extending across the top of the unit to the steam drum. The lower portion of the tubes pass beneath the refractory floor, thereby connecting the upper and lower drums. At the front wall of the combustion chamber, the refractory is supported by anchor bolts secured to a steel casing that encloses the entire unit. The furnace refractory on the side wall, rear wall and roof consists of tile supported by the tubes.

Fuel is delivered to the furnace through the front wall and burns in a direction parallel with the long axis of the drums. The oil burner is of the horizontal rotary cup, air-atomizing type equipped with controls for a 4 to 1 firing range. All air for combustion supplied by the forced draft fan passes through a register interlocked with the fuel feed, and volumes vary in accordance with the firing rate.

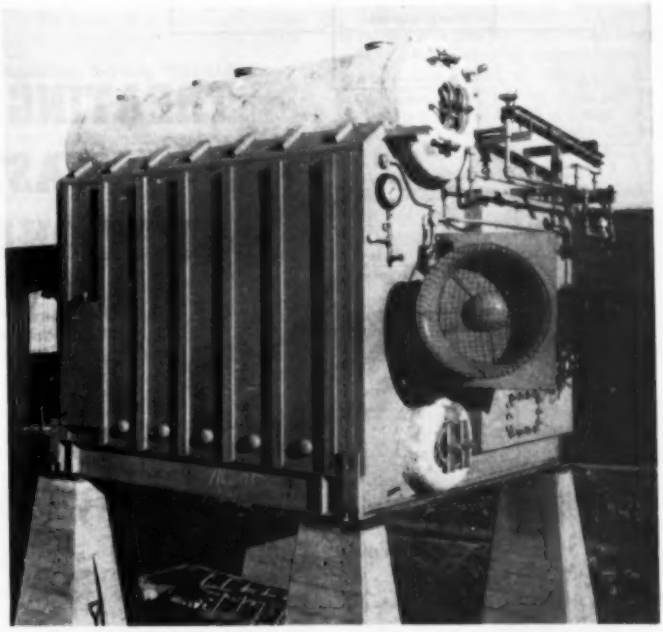
Controls

Basically, the combustion controls are designed to maintain a constant pressure of 125 psi through a load range of 3750 to 15,000 lb of steam per hr. When lower loads occur, the burner cuts off until the pressure drops to a predetermined point. An electric timer then automatically operates the forced draft fan to purge the furnace, starts the burner motor, energizes the bottle gas-electric ignition system and opens the feed valve. After proper furnace conditions are established the timer cuts in the flame failure protection and restores pressure control.

The steam generator was factory assembled by the boiler manufacturer and delivered to the construction site on a structural steel base. Philadelphia Electric is installing the unit and will furnish the balance of the equipment required to complete the steam generating plant. This equipment includes the breeching, a 30 in. dia by 40 ft stack, blowdown tank, a 4 ft by 11 ft condensate storage and boiler feed tank, two motor driven boiler feed pumps, fuel oil supply pump and storage tank, piping exclusive of boiler piping, building and foundations.

Condensate will be returned by gravity to a 70 gal receiver equipped with a pump capable of handling 37.5 gpm against a discharge pressure of 15 psi. From this point it will be pumped to the storage tank which will be set horizontally 10 ft above the suctions of two feedwater pumps, each having a capacity of 40 gpm at a total head of 400 ft. City water make-up flowing through a float control valve will also enter the feed tank where a steam coil controlled by a temperature regulator will heat the mixture to 180 F. In addition, a low water cutoff has been purchased which stops the fuel feed if any difficulties develop in the supply system that cause drum level to fall below a safe operating point.

The steam generating unit and auxiliaries are now being installed for construction usage and will be housed in a temporary building approximately 25 ft wide and 32 ft long. This installation will provide steam for construction quarters heating and protection of concrete poured in cold weather. New buildings will also be heated from the installation until the plant heating system is available for service. The boiler, however, will remain at the present location until all construction requirements are satisfied. At that time, the unit will be moved and installed in a permanent manner in the new plant layout to serve as an emergency steam supply for heating.



The grade elevation shown in the above photograph is temporary. When the area has been filled, finish floor level in the boiler house will be approximately 16 in. below the bottom of the unit

PRINCIPAL EQUIPMENT FURNISHED FOR THE INSTALLATION

Steam generator	Foster Wheeler Corp.
Fuel burning equipment	Combustion Equipment Div., Todd Shipyards Corp.
Forced draft fan	L. J. Wing Mfg. Co.
Boiler feed pumps	Ingersoll-Rand Co.
Condensate receiver and pump	Swaby Mfg. Co.
Feedwater regulator	Northern Equipment Div., Continental Foundry & Mach. Co.
Control equipment	General Regulator Corp.
Flame failure protection	Combustion Control Corp.
Water column	Magnetrol Incorporated
Feedwater temperature regulator	Sarco Co., Inc.
Float control valve	Foster Engineering Co.
Stack	Philadelphia Iron Works, Inc.

***Fig. 1*—This drawing shows the relative arrangement of equipment for treating strong acids and concentrated cyanides**

Effective alkaline-chlorination treatment of waste from plating and pickling operations assures National Carbon that no harmful effluent leaves the plant. Acid dumps flow to a tile lined tank for neutralization with caustic

TREATING INDUSTRIAL WASTES AT NATIONAL CARBON

C. F. PEARSON, *Head of Product and Process Control*
St. Alban's Works Laboratory
National Carbon Co.

NATIONAL CARBON COMPANY's flashlight case plant in St. Albans, Vermont is effectively treating plating and pickling solution waste with the alkaline-chlorination method. Cyanides are destroyed, strong acid completely neutralized, metallic salts are precipitated and sludge removed by settling. Waste liquors leave the plant free from materials of harmful character, free from turbidity, are non-acidic and contain small quantities of dissolved chlorine. Precipitates are taken away either as a thick sludge or evaporated cake.

In the full chlorination of the wastes under alkaline conditions, all cyanides are completely broken down into innocuous ammonium compounds, salt, and sodium carbonate with from 1 to 3 ppm of free chlorine in solution to insure the completion of the process. With the exception of chromium, all metals, whether originally combined with cyanides or otherwise, are precipitated as oxides, basic oxides or hydroxides, or carbonates.

Features of the setup in the St. Albans plant are several. Among them is the precaution taken in layout to prevent introduction of strong acids into cyanide solutions and vice versa. Another feature is the accumulation of strong cyanide dumps in a storage tank so they can be proportioned into the general flow thus effecting more accurate control and keeping the peak load on the system at a minimum. A third feature is the continuous treatment flume, which recognizes variations in acidity of waste waters and automatically corrects for them. Detention tanks following the flume treatment provide a further safeguard for assuring adequate neutralization and chlorination. Use of a large settling basin following the detention tanks blends the liquors and insures uniform properties of the waste material going on to the city sewage plant.

Types of Waste

At various times, production requirements have involved silver, copper, bright nickel and chrome plating solutions, bright dips, strong acid pickles and cleaners and miscellaneous solutions such as chromic acid solution

for treatment of zinc and phosphatizing solution for treatment of steel. Every effort is made to keep the use of phenolic materials at a minimum because, (a) phenols combine with chlorine and disrupt calculations and (b) phenolic compounds, especially when chlorinated, are undesirable substances in stream and lake waters.

By referring to the schematic diagram, Fig. 1, it can be seen that the waste waters come from two sources; the forming and stamping department and the plating room. Three paths are taken; (a) strong acid dumps go to one tank, (b) concentrated cyanide dumps go to a second tank, and (c) the balance of the flow, which represents a large portion of the water flowing through the processing departments, travels directly to the treatment flume. Sanitary sewer wastes are handled in an entirely separate system that joins the treated industrial waste lines before entering the city sewage lines.

Strong Acid Disposal

The relatively strong acid dumps that must be removed periodically from the plating room and the forming and stamping department consist of concentrations of sulfuric, nitric, and hydrochloric acids. These may vary in strength from 5 per cent to concentrated and can aggregate as high as 2000 gal per month. They are led to a 6000 gal underground tile lined tank and once a week, under normal conditions, their acidity is measured. Then slightly more than the equivalent amount of flake caustic is dissolved in a steel tank, located above ground, and added slowly to the concentrated acid solution. As the caustic is added, the mixture is agitated with low pressure air from a portable compressor. After neutralization is completed, the contents are allowed to stand until the oxide and hydroxide precipitates are settled out. The supernatant liquid is then pumped into the sanitary sewer while the precipitate, in the form of a thick slurry, is allowed to gradually build up in the neutralization tank. Periodically, a centrifugal pump transfers the slurry to a small tank trailer and it is hauled off to the city dump.

Handling Strong Cyanides

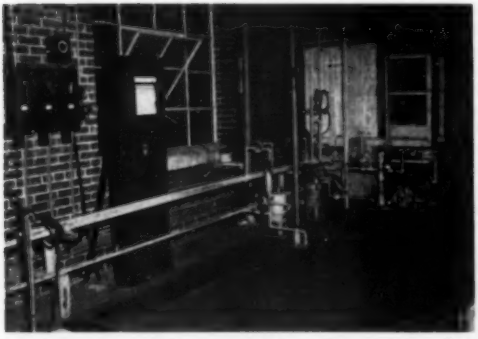
Strong cyanide solutions, sometimes as KCN or NaCN and occasionally as a complex from copper or silver plating baths, require periodic dumping. Since the amount of material removed has been as much as 4000 gal per month, it has proved highly advantageous to direct the strong cyanide solutions to a separate storage tank. When the volume is sufficiently great the concentration of the cyanide ion is determined and then, over a period of several days, the contents are introduced to the treatment flume by a proportioning pump. Thus strong cyanides can be destroyed at the same time as the lower concentration solutions that appear in the main flow of waste.

Main Waste Flow

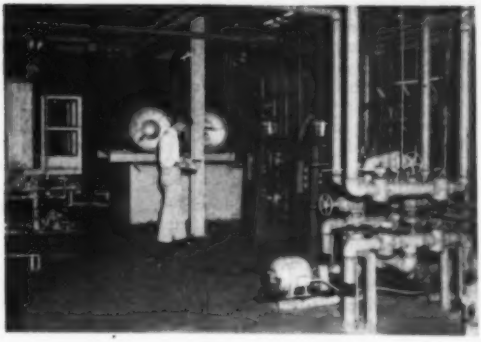
While concentrated materials are being directed to either the acid or cyanide storage tanks, the balance of the waste water, that originates primarily in the rinses, flows directly to the treatment house through the main drain. Volumes have amounted to 200,000 gal per 8 hr shift with the treatment plant capable of handling 600,000 gal over a 24 hr period.

The general wastes are usually slightly on the acid side but can also contain greatly diluted alkaline cleaners, acids, cyanide dips, nickel, chromium, zinc, copper and silver plating bath solutions. They are conducted to a concrete flume 1½ ft wide by 35 ft long where a liquid level of about 30 in. is maintained at a weir near the exit end. At the inlet end of the flume, the concentrated cyanides previously mentioned are introduced as required and partially diluted by the main waste

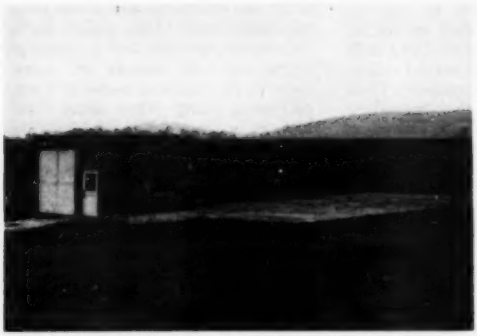
All mild solutions flow directly to the disposal building for continuous processing. Concentrated cyanides are treated simultaneously at this point



Metal plates cover the treatment flume located in the floor of the disposal building. Caustic tank, agitators and pH recorder are shown in this photo



One chlorinator feeds the flume while a second is used for intermittent treatment of batches in the detention tanks if excess concentrations develop



Treated waste flows to a basin where insolubles settle out. Only clear effluent discharges to the city sewers

Laboratory analysis of samples from different parts of the system provides data for controlling waste quality

flow. Then dissolved caustic, from one of three compartments in an overhead make-up tank, feeds automatically into the mixture, flow rate being determined by an indicating and recording pH controller located further along near the discharge end of the flume.

After caustic has been added, the water passes over one baffle, past mechanical agitators and under a second baffle. At this point, treated waste water containing gaseous chlorine introduced by a chlorinator is pumped into the flume. City water can be used for this purpose if the recirculating pumps handling waste water should fail.

Chlorination

All chlorine is purchased in liquid form and arrives at St. Albans in large pressure cylinders that are stored outdoors. It is gasified as needed with one cylinder supplying normal requirements while a second unit is kept ready in the treatment house as a reserve for the cylinder in service. These cylinders are stored on a large weigh scale to facilitate calculating chlorine usage.

Although the amount of chlorine introduced can be controlled by the flow of waste water passing through the flume, usually requirements are so variable that manual setting of the chlorinator is necessary. After chlorination, the waste water is again agitated before passing to the section containing the element of the pH controller, which regulates the introduction of caustic and indicates and continuously records the acidity.

Detention Tanks

From the flume, the treated waste flows into two detention tanks that are filled alternately. Each tank holds about 35,000 gal, and when one is full the flow is directed to the other. The contents of the full tank are then thoroughly mixed by two pumps that circulate the liquid between sections of the tank to permit accurate determination of acidity and chlorine concentration and check the disposal process.

In the detention tanks, corrective measures can be taken should a sudden slug of acid or cyanide be introduced into the general drain or if normal treatment in the flume is incomplete. A second chlorinator, identical to the first, can treat the 35,000 gal batch at this point, and dissolved caustic can also be added as required. In fact, if the plant is on intermittent operation all treatment can be carried out in the detention tanks. Since each tank will hold about 90 min normal output from the flume, there is usually plenty of time to check and recheck the concentration to insure that only completely treated waste leaves the plant.

Sludge Removal

The settling basin consists of a wood decked concrete tank about 40 ft wide by 100 ft long with a sloping bottom that drops one ft in the 100 ft length. Waste water enters this basin over the side of a trough across one end where the fall is short and not enough to stir up the material which has already settled out. Normal water depth in the basin averages 4½ ft which is the equivalent of several detention tank loads. This results in gradual waste water movement and insolubles settle out before the clear liquor decants over a sill at the lower end of the basin to the outflow sewer.

Periodically over a week end, the supernatant liquid is drawn off, and the precipitate is transferred by a diaphragm pump to shallow earthen pits. Here the water gradually evaporates and soaks away leaving a thin quite solid cake that can be shoveled up and trucked away. In the National Carbon plant there is not enough metal content in the cake to justify recovery.

Quality Control

Quality control of all operations is accomplished by accurately weighing the caustic and chlorine used and continuously measuring the amount of waste water flowing through the treatment plant. The pH values measured and recorded automatically in the flume are checked by laboratory analyses of spot samples. Free chlorine content of samples from the detention tanks and settling basin and sludge content of samples from the effluent leaving the settling basin are determined regularly. In addition, a small aquarium containing goldfish is continuously supplied with a mixture of treated waste and city water having a higher concentration than would ever exist in the stream that receives the plant effluent. These fish thus live under much more severe dilution conditions than they would be exposed to in nature, and any deleterious effects on them can be observed and the difficulty corrected immediately.

Mention was made previously of precautions taken to minimize the possibility of mixing strong acids and cyanides. This simply consists of using separate tanks for each material, located adjacent to special floor drains that are ordinarily kept plugged. Since the tanks have no drains, employees must use special hoses to siphon their contents into the proper sewer. With this arrangement, the chance of error is extremely limited as all operators receive instructions on procedure.

The St. Albans plant of National Carbon Co. has now been operating for almost five years, and the waste disposal system has proven very satisfactory in all respects. Naturally every plant has specific problems and requirements but this described installation can serve as a guide when designing a treatment system for processing wastes from plating operations.

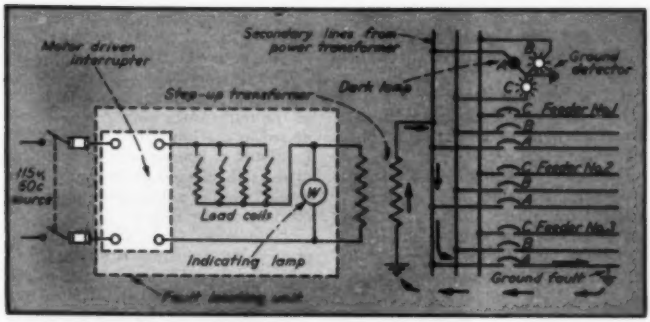


Fig. 1—The standard ground detector shows which phase conductor is faulted. The fault locating unit generates an identifiable signal which can be traced through the system with a pickup coil

Ground faults on ungrounded distribution systems often may be difficult to locate. This method can be used to find the defective feeder and to determine fault location without prolonged power interruption on circuits

FRANK E. REEVES
Electrical Engineer

LOCATING GROUNDS ON LIVE CABLES

A MODERN TREND toward grounded distribution systems is taking place in utility and industrial installations. However, many existing systems, as well as new installations, are of ungrounded design based on the premise that, if grounds appear one at a time, they do not cause outages if cleared before a second ground occurs.

There are two major disadvantages to the ungrounded system: (a) Faults frequently occur in pairs due to the overvoltages which appear on the other phase wires the instant the initial ground develops. Other weak points break through to ground under these conditions. (b) When one fault appears on the ground detector, it is difficult to locate.

Only alternative to "living with" item (a) is periodic overvoltage testing of feeders and equipment. This policy is seldom employed on distribution and industrial systems.

Customary procedure in locating a ground showing on the detector, item (b), is to arrange for short outages on the feeders after inspection and patrolling have failed. The feeders are then tripped out one at a time and restored to service immediately. When the ground detector indicates "clear", the fault has been localized to that feeder.

If further inspection fails to reveal the ground, equipment served by the feeder must be de-energized, one unit at a time. If after each unit has been de-energized, no change has appeared in the ground detector, trouble on the feeder is indicated. Where it is in a long run of conduit, whether metallic or underground duct, special equipment is necessary to locate the fault.

With Feeders Energized

Since only one ground exists on the circuit isolated by use of the ground detector, a tracer signal may be introduced and the "cut and try" method eliminated. Disconnecting the line is unnecessary. Although the signal will appear in every part of the system, it will be strongest along the most direct electrical path to the ground.

Fig. 1 is the basic circuit showing how ground faults may be located on "live", ungrounded systems. If the system is not faulted, all three lamps in the ground detector will appear relatively dim. A solid ground anywhere on the secondary circuit of the same power transformer will cause one lamp to go out and the others to burn at full brilliance. (Potential transformers have been omitted from the ground detector to simplify the diagram.)

In Fig. 1, an accidental ground is shown on phase *A* of feeder No. 3. The "dark" lamp will indicate the grounded phase and the fault locating unit is connected to that phase as shown.

Voltage on the high side of the transformer in the fault locating unit should be essentially the same as that of the power system on which the ground is to be located. The scheme may be used on systems of 4000 v and lower.

Usual precautions should be taken in connecting and disconnecting the lead from the fault unit transformer to the live bus. If only one load coil is connected in the circuit, the connection may be made and broken with very little arcing. If all load coils are connected, and the system voltage is 2300 or 4000, a hot arc 1 to 2 ft long will occur when the test connection is made and broken. If the ground clears, and

Fig. 2—The tracer signal from the grounded conductor is induced in the detector coil and can be heard in the receiver. Core and winding shape are shown in insert

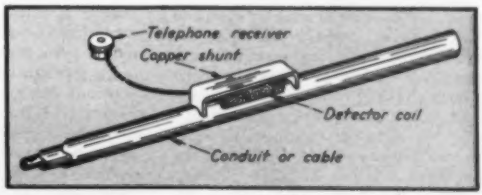


Fig. 3—When tracer signal return path is in sheath or conduit, signal is neutralized. Copper shunt with adequate proportions will carry return current past coil

another appears on one of the other phases during the test, no harm will be done other than the possible blowing of a fuse in the fault locating unit.

After the test connection is made, ability of the ground to pass current should be checked by adding load coils one at a time. The indicating lamp in the *fault locating unit* should be glowing dimly at all times. A change to full brilliance or more indicates that the ground has cleared. Too rapid addition of load coils can easily cause this to happen, and they should be added slowly, quickly opening the last switch closed if the lamp flickers and brightens.

When the ground will pass considerable current without causing the lamp to brighten, it has been carbonized, and the motor-driven interrupter may be started to provide a distinguishable tracer signal. The signal is picked up by means of a detector coil connected to a telephone receiver.

The detector coil should be held near each phase *A* conductor leaving the bus, and the conductor having the highest volume of signal should be followed to the ground fault. Fig. 2 shows the detector coil applied to a three conductor cable or to a steel conduit containing the three wires of a feeder circuit.

The interrupter produces a low frequency beat signal which is easily distinguished from the 60 c hum due to load current. However, a large part of the ground return current may be carried by sheath or conduit and will have a neutralizing effect on the signal. Where three conductors are in the same enclosure, whether sheath or steel conduit, the effect may be overcome by moving the coil around the cable or conduit. If there is fault current and tracer current signal flowing in one conductor, signal intensity will increase when the coil is nearest that conductor. Constant signal intensity as the coil is moved slowly around cable or conduit indicates that the fault has been passed.

Another complication arises in a single conductor cable when the ground is approached and all return current is flowing in the sheath, neutralizing the signal. To overcome this condition, a shunt is used as shown in Fig. 3. Being copper, the shunt has very low resistance and carries a large percentage of the sheath current around the coil. Due to its closer magnetic coupling with the conductor, the coil then picks up a stronger signal if tracer current is actually flowing in the conductor.

When the shunt circuit is made, increased signal intensity indicates fault current flowing in the conductor. If intensity decreases or does not change, lack of fault current in the conductor is indicated. The signal heard, if any, will be entirely from current in sheath or conduit.

Due to the very low voltage available, contacts between shunt and sheath or conduit must be very clean to provide extremely low resistance.

The same unit will also locate faults in de-energized cables. It may also be used for live phase identification, locating open circuits in cable and overhead lines, open faults in submarine cables, and for other similar purposes.

Design Features

Load coils are iron core inductances having approximate impedances of 20, 35, 50 and 100 ohms. If five coils are used, there may be two 100 ohm coils. The object is to be able to obtain any value of current from 1 to about 10 amp in 1 amp steps. It is necessary to "carbonize" a fault thoroughly in order to obtain a dependable, steady flow of interrupter current. Ease with which this can be done is dependent upon the insulation involved, conditions at the fault, (wet, dry or submerged) amount of damage to the insulation, and other factors.

A heavy current suddenly applied will burn most faults clear. Experience has shown that it is best to start with a 100 ohm load coil. If the lamp across the low voltage side of the transformer dims when the load switch is closed, it indicates that fault current is flowing and by adding load coils slowly, a "solid" carbon path is usually attained. Then the interrupter may be started and the fault traced.

The same load coils may be used regardless of the voltage on the high side of the transformer since they are connected in the low side. Current in the fault will, of course, be in inverse ratio of the voltage ratio of the transformer connection, but volt-ampere input does not vary appreciably.

Transformer rating is not too important, except that it is usually small for portability. The one kva size is usually used. Since it has some impedance under short-circuit conditions, it would probably not be severely overloaded even with all load coils in. It is seldom necessary to use all load coils except during the brief carbonizing period. When "chasing" the fault, a 3 amp load coil is found to be the best.

The interrupter may be constructed with two commutators designed to provide a slow beat frequency readily distinguishable from the steady power frequency hum, which will be loud if the faulted feeder is in the vicinity of other heavily loaded feeders. The beat frequency should sound like a growl, and for this reason the interrupter is often called "growler".

The detector coil is iron-cored. The wire (about size 22) is wound longitudinally on laminations which are shaped like segments of a cylinder. Impedance should be 80 ohms to match the resistance of an 80 ohm telephone receiver for maximum sound output.

For Industrial Use of Neuclear Radiation

• Industrial use of atomic radiation for applications such as non-destructive testing of metal castings and cold sterilization of foods and drugs will bring a new group of problems in the plant services. Included will be consideration of methods for handling and shielding. In some instances, taking the source of radiation with its shield to the irradiated object may be preferable. In others, a conveyer or batch system for carrying the product to the heavily shielded and permanently located intense source, as well as a remote control system, will be indicated.

To solve these and other problems, Stanford Research Institute has built its new Radiation Engineering Laboratory, and recently announced its opening. The largest source of radioactivity outside of AEC installations, a 5000 curie source of cobalt 60 five times the power of any presently available for industrial or medical research, is being obtained from Brookhaven National Laboratory for the research project.

The new laboratory, scheduled to start operations in the late spring, will develop and engineer practical and safe systems for the use of large amounts of radiation in a wide variety of possible industrial applications.

Companies wishing to explore uses of radiation for their processes or products may take samples to the laboratory for irradiation at a specified intensity and duration. The samples will then be returned to the company for analysis and study.

In the laboratory itself, the cobalt 60 source will remain at all times in an underground, water filled tank for safety. Protective devices, remote control equipment and carefully regulated conditions for experimentation have been designed into the system. Laboratories have been arranged for high medium and low levels of radiation intensity. The new facility will also contain a general purpose pilot plant.

Fig. 1—Intensity of the oxy-acetylene and iron oxidation reactions permit sizable heating and cutting operations that are easily controlled and are exceptionally portable

Fig. 2—Accuracy of flame cutting depends primarily on the ability to hold the torch steady. A simple torch stand and turning rolls give an accurate bevel, ready for welding

Fabrication and Installation Practices Employing

OXY-ACETYLENE PROCESSES

Although manufacturers of piping and other high pressure equipment employ special techniques and forming machines, the oxy-acetylene torch is a versatile tool that is useful in most factories. Here is a survey* of their practices that have widespread applications

E. P. AULER, ***Superintendent of Pipe Fabrication***
Taylor Forge and Pipe Works

FABRICATION and installation methods provided by the various oxy-acetylene processes permit manufacture and assembly of pipe, fittings and equipment into integral systems for conveying liquids and gases in piping and processing installations otherwise impossible under present conditions of high temperature-pressure demands. Gas transmission lines carry pressures as high as 1000 psi in 34 in. diameter pipe. Steam plants use systems at 1500 psi and 1050 F. Oil refining equipment with miles of piping operates at even higher pressures and temperatures, and also as low as -325 F.

Basic Considerations

In applying the oxy-acetylene processes to pipe and equipment fabrication, there are three basic oxy-acetylene processes:

1. Cutting.
2. Gouging.
3. Heating with a torch.

Since the major part of pipe fabrication is performed on ferrous materials, use of the oxy-acetylene cutting torch provides a convenient, portable means for the cutting and shaping of steel at a low cost. Essentially, oxygen cutting of ferrous materials merely involves direction of a sharply defined jet of pure oxygen into an area previously heated to ignition or kindling temperature (about 1600F) and as the iron is oxidized, slowly and uniformly moving the jet along the line to be cut. If cutting is continuous, however, it is necessary to supply heat to the metal just ahead of the oxygen stream

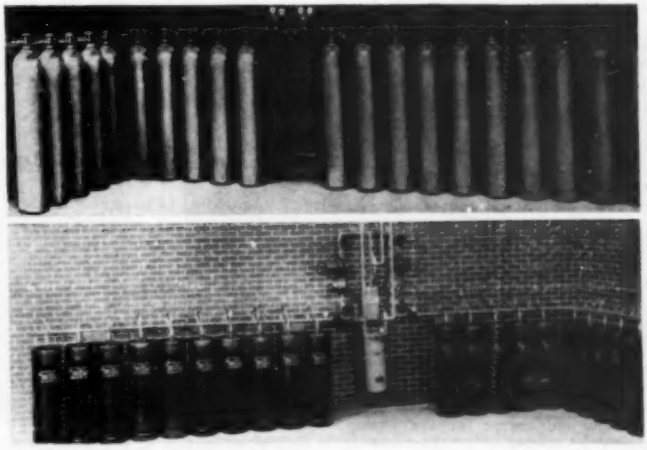


Fig. 3—Portable oxygen and acetylene tanks are suitable for most operations. For high consumption, gases piped from a central source as above are preferred

*Abstracted from a paper presented at the 1951 Annual Meeting of the International Acetylene Association at Montreal, Canada.

by preheat flames from the cutting tip.

Oxy-acetylene gouging is a rapid and economical method of forming U-shaped grooves by removing surface or edge metal. In pipe fabrication, gouging operations are:

1. Forming weld grooves suitable for high quality arc welds.
2. Gouging of the root side of electric arc welds.
3. Spot gouging of temporary tack welds and removal of defective weld metal.

Gouging employs a special nozzle to deliver a relatively large volume of oxygen at low jet velocity. With proper preheat flame distribution, it will cut a smooth, accurately defined groove in steel.

As a means of heating, combustion of approximately equal volumes of oxygen and acetylene produces a flame far hotter than that of any other known gas flame. Temperature of the flame is estimated at 6000 F. It is a convenient source of localized heat for a wide variety of operations, such as heating for forming, bending, or straightening, and for preheating and post-heating for welding.

Gas Supplies

Three basic methods are used to supply and distribute gases. The first and simplest unit consists of large cylinders of oxygen and acetylene, both with regulators, mounted on the common cylinder truck or "buggy" for mobility and ease of handling. To this can be attached most types of manual oxy-acetylene equipment and the entire unit transported to the work site. A group of the portable "buggies" are adequate for a small shop or for field operations at a low initial cost. Almost all shops, regardless of size, will use them to supplement other methods.

However, when higher rates of gas flow are required, as for continuous machine cutting, manifolding should be employed. There are two such systems: first, portable manifolding with the unit at the work site; and secondly, stationary manifolding with duplicate manifolds supplying a piping system as shown in Fig. 3. One group of cylinders is used as a supply while the other is being replaced, assuring a continuous gas flow.

Another variation possible is the manifolding of oxygen cylinders and the generation of acetylene from calcium carbide. Generators are available in sizes capable of producing the 12 to 6000 cu ft per hr of acetylene, and as stationary or portable units.

Manifolding provides a continuous gas flow and, except for the piping system, is economical in initial cost. It is best suited for the average fabricating plant with moderate requirements.

The third and most adequate source involves a piping distribution system throughout the entire plant. The source of oxygen is either long high-pressure tanks permanently mounted at the plant or on truck trailers, or a liquid oxygen storage holder. Both are permanently connected to the system through a suitable regulator.

Acetylene is supplied to the system by means of relatively large generators, with sufficient stand-by equipment to allow recharging of spent generators.

Piping System

The piping system must be properly designed to handle and distribute the gases without undue pressure drop and to deliver adequate volume required at the various work sites throughout the fabricating shop.

Connections at the point of use are made by suitably designed equipment. The oxygen line is generally fitted with a filter, a shutoff valve, hydraulic back pressure valve, relief valve, a vent pipe to the outdoors and usually a regulator. The hydraulic back pressure valve is a protective device which prevents flashback or backfires from entering the main piping system and is strongly recommended for all acetylene piping systems (see local code).

The piping system involves a large investment but results in economical gas cost and is suitable for larger fabricating shops. Since initial cost is high, there must be adequate capacity for future expansion.

Cutting Operations

Probably the most common use is preparation for welding. For example, it is desirable to machine cut pipe ends as illustrated in Fig. 2. A torch is mounted on a stand, and work is revolved at a uniform rate. The torch can be set at the proper angle to produce a smooth welding bevel suitable for any code welding with a minimum of cleaning after cutting. A variation is a device which clamps to the pipe and is so designed that the torch revolves around the pipe at a uniform rate.

In preparation of outlets on main line piping, Fig. 1 illustrates the manual cutting of a 14 in. outlet on 36 in. pipe. With manual cutting, the outline must be center punched for an easily followed mark. This method will require some grinding to prepare the section for welding. It is often used where there are a few outlets and equipment and setup time for machine cutting would not be warranted.

To illustrate the machine torch cutting technique used on outlet holes, a similar outlet was cut with a machine cutting torch, Fig. 4. It is possible to set the torch at the proper angle to prepare the welding groove. A minimum of cleaning is necessary and the outlet and hole have good fit up, Fig. 5.

Special Cuts

In header work where there are a number of outlets, machine cutting has definite advantages. Equipment has been developed which can accurately cut the holes in the main run and also cut nozzle pipe sections to fit the main run contour. They can produce square or bevel cuts for straight, curved, or angle work on almost any intersection required in pipe fabrication work.

In the manufacture of large diameter pipe, as with butt joints in all heavy plate, the edges of the plate must be prepared for welding. A double V-groove weld requires a double bevel with a land. This operation can most economically be performed with oxy-acetylene equipment shown in Fig. 6. It is so designed that all three cuts are made simultaneously and the resultant edge preparation is ready for welding with only a slag chipping operation. Each cut could be made separately using a single torch.

Gouging Operations

Gouging equipment has been accepted by fabricating shops as another tool to provide better pipe fabrication. At present the majority of gouging operations is performed manually, Fig. 7. In this instance, the operator is forming a welding groove and cutting the material down to the sound metal of the inside weld. It is interesting that the material being gouged is 4 to 6 per cent Cr-Mo and no difficulty is being encountered.

Importance of this process in such an operation, as well as in removing defects in welds, is the fact that the operator has full control of the depth groove. He can also see when he has reached sound metal, because of differences in flow while the area is molten. Compare this with grinding or chipping where the metal is smeared over defects during the operation.

In fabrication of large diameter piping, most of the joints are manually torch cut because they are of the job shop variety and do not lend themselves to more costly machine cutting setups. A straight cutting operation followed by tacking and then a gouging operation produces a welding bevel or groove most suitable for code welding. This groove is then welded and the underside again gouged to sound metal as previously illustrated.

Uses of the Heating Torch

A principal use of the heating torch is preheating of materials prior to cutting and welding. With the increase in operating pressures and temperatures, alloy steels have been introduced to

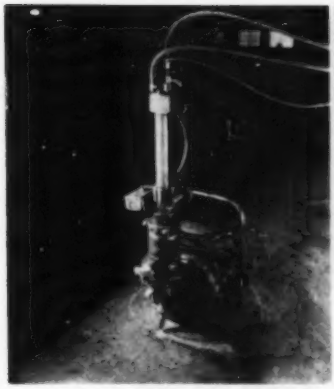


Fig. 4—Machine cutting an outlet like that in Fig. 1. Note flat base for the machine designed for use on plate stock

Fig. 5—Lack of cleaning, good fit up, and ease of welding make machine cutting desirable for frequent operations

Fig. 6—Straight line cuts may include manual to multiple torch machine cuts for preparing the arc welding grooves

Fig. 7—Gouging is another method of preparing the welding grooves; allows cleaning defective metal from root of first pass on underside. It also removes weld and plate defects

Fig. 8—High alloy steels must be preheated before welding, and often before cutting. The acetylene torch is convenient, can be used on many jobs where a furnace is impracticable

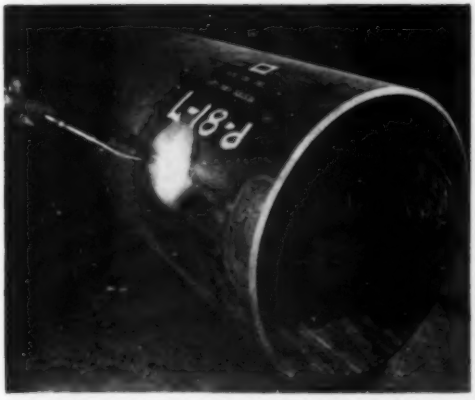


Fig. 9—Heating metal to the plastic state for bending and forming is common. The acetylene torch can also be used to "warp" metal back to shape by local heating as shown above

Fig. 10—Special attachments allow the cutting of non-oxidizing iron alloys like stainless steel. Many operations, difficult because of material or location, are made easier

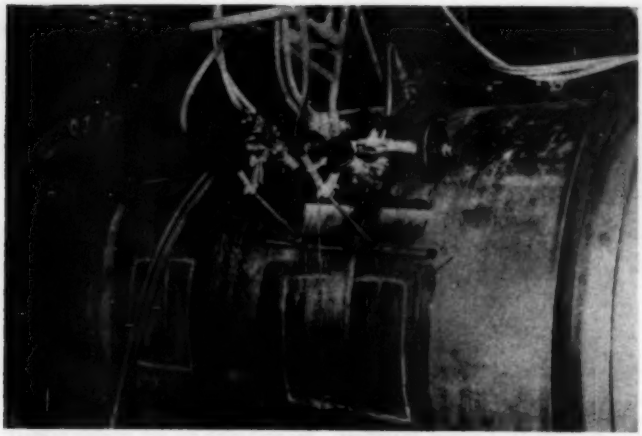


Fig. 11—For local stress relieving, thermal stresses from the heating torch add to residual stresses, exceeding the yield point of the material. The water spray following below torch insures cool surrounding metal for the necessary restraint

provide pipe structures with the necessary physical and metallurgical properties. While some of the low alloy steels in thinner sections can be welded like mild steel, heavier sections, restrained joints and certain of the alloys require preheating prior to any *cutting or welding* operations. The 1951 "Code for Pressure Piping" (ASA B 31.1-1951) lists requirements for carbon and carbon-molybdenum steels.

When the preheat temperature range is from 100 F to 400 F, the heating torch is played along the joint so as to uniformly heat the area without too great a temperature variation. Excessive and too rapid a heating are to be avoided. This operation is nearly always done manually.

If the preheat temperatures range from 400 F to 900 F, it is often necessary to accurately measure temperature prior to and during welding or cutting. This can best be done with surface pyrometers or special waxes manufactured to melt at a given temperature. The heating torch is used as necessary to maintain the temperature. A typical preheating operation is shown in Fig. 8.

Spot Heating

In the welding of fabricated piping, a certain amount of distortion occurs because structures are relatively thin and thus are not restrained. Although supports and struts are applied to prevent distortion it is often necessary to perform a straightening operation, best done with a heating torch, Fig. 9. It is used to rapidly heat a small band to a plastic temperature. Since the surrounding area is cold, the plastic metal, expanded by heat, upsets slightly. As the entire section cools, the upset area "pulls", causing a change in the shape of the section. Generally, several small bands are better than a few large ones.

The third important use is in forming operations. With the oxy-acetylene heating torch, areas of about 6 in. diam can be heated to approximately 1700 or 1800 F and the area deformed to required contour by a hand forming operation.

Special Applications

There are several special applications that should be mentioned.

The high chromium and chromium-nickel alloys can be successfully torch cut with special equipment and a powder or fluxing material to remove the oxides of the alloying elements, which prevent the oxygen stream from reaching the iron. Such an operation on Type 347 stainless steel is shown in Fig. 10. The cut must be ground before further operations are performed on the piece. This method is applicable to any thickness and 12 in. billets have been successfully cut.

Stack cutting offers a means of cutting a number of plates simultaneously with a single or multiple torches. Plates are stacked and securely clamped to form a thickness of 3 to 4 in. It is used where identical shapes in large quantities must be cut from plate.

Cutting Thin Sheet

Although not a special application, cutting of material less than 3/16 in. thick requires techniques entirely different from those previously described. Clean square cuts can be made at relatively high speeds if a leading angle is applied to the torch nozzle. Proper tips with accurate control of the cutting-oxygen pressure and size and type of preheat flame are necessary.

Stress Relieving

An unusual application of the heating torch is low-temperature stress relieving of welds. Two multi-flame oxy-acetylene torches are moved along on either side of the weld to be stress relieved, followed by a spray of coolant water. By moving the assembly at a speed relative to the thickness, this application of heating and cooling, with the resulting expansion and contraction, in effect plastically deforms the weld area where thermal stress plus residual stress exceed the material yield

Fig. 12—Regardless of shape, size or type of metal structure, the oxy-acetylene equipment is an economical, often necessary, auxiliary to arc welding operations

point. It thus mechanically stress relieves the weld area, Fig. 10, because yielding has released residual stresses.

Conclusion

The type of work that can be performed, ease of control, quality product, relatively low initial cost, and, in general, over-all versatility of the processes give the fabricator, large or small, a tool adaptable to many conditions in shop or field.

However, equipment must be used with proper control, and operators must have a good working knowledge of it, for greatest value to be derived from the processes. Since the mixture of oxygen and acetylene is explosive, rigid safety rules must be adhered to and all required safety precautions taken. Poor quality work is generally the fault of misused equipment or lack of operating know-how, not in the processes themselves.

SPECIAL REPORT REPRINTS

"Packaged Electrical Distribution Equipment", February 1952
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AUTOMATIC STAND-BY PUMP CHANGEOVER FROM ELECTRIC TO STEAM DRIVE

R. G. CAMERON, *Industry Engineer*
Minneapolis-Honeywell Regulator Company

• In many of today's plants where continuous processing is taking place, pumping operations must proceed without interruption in order to avoid serious loss of raw material, or actual danger to the plant itself. For this situation, an excellent insurance for continuous pumping in event of electric power failure is a stand-by pump driven by a steam turbine.

However, the matter of providing immediate, automatic start-up of such a stand-by pump in the event of electrical power failure is one which can lead to unnecessarily complicated control systems. The system shown here employs a minimum of components, and has several advantages. Being pneumatic, it is still operable at times of electrical power failure.

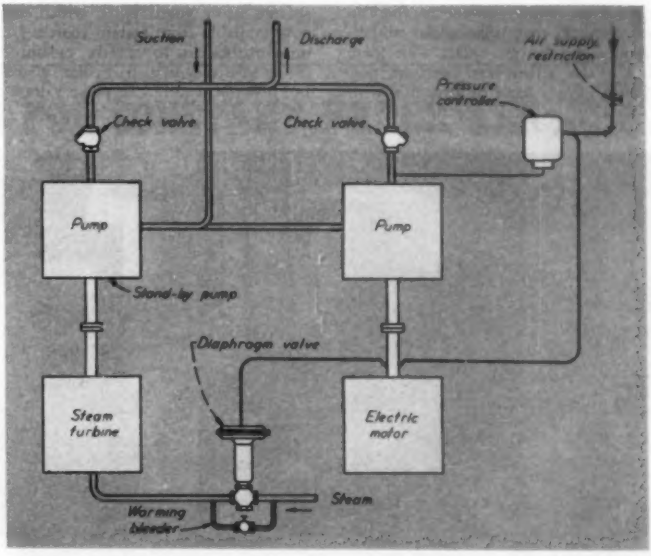
The common suction line branches and feeds both pumps. When the electric motor driven pump is in operation, as is normal, the turbine driven pump is not operating. The discharge line from both pumps feeds through check valves and into a common line.

A tap is taken off the discharge line from the electric motor driven pump between the pump and the check valve. This feeds a pneumatic pressure controller with an appropriate range, depending upon the pump pressure. The pressure controller, in turn, controls a motorized diaphragm valve in the steam feed line to the stand-by pump turbine. A small by-pass around this valve must admit enough steam to the turbine to prevent damage on starting.

The sequence of operation is: When power fails on the electric pump, the pressure ahead of the check valve in that discharge line falls quickly to suction pressure, and the pressure controller opens the steam valve. Steam is admitted and the turbine driven unit takes up the pumping job.

The controller does not limit the pressure of the turbine driven pump because it is tapped in on the other side of the check valve. Further, when connected in this manner, the controller does not cut in during temporary pressure reduction if set to cut in at only a little higher than the suction pressure.

When electrical power is restored, it is not necessary to reset the pressure controller manually. Simply press the manual starting buttom for the motor and the electric pump starts. Pressure then builds up so that the controller throttles the valve shut in the turbine steam line and stops the stand-by unit.



If the electric motor supply fails, the controller actuates the valve starting the turbine drive, which carries the pumping load until the motor is restarted

Power transmission

Engineering data and information to aid in selection, application and operation of equipment used in transmission of mechanical power

POWER TRANSMISSION DRIVE REQUIRES PROPER GUARD

Guards placed over mechanical power transmission drives, whether they are purchased or made in the shop, provide a means for preventing unnecessary accidents. The enclosure should encase all moving parts and be removable

JOHN E. HYLER, *Consultant*

THROUGHOUT INDUSTRY, careful attention is now given to providing suitable guards for belt drives, gears and other power transmission devices with which workmen are liable to come in contact. There has been a change in this respect since the old days. Seldom is a long overhead horizontal belt drive found. Belt drives in general are shorter. It is still necessary, however, to enclose them in such manner that one cannot absentmindedly come in contact with them and receive a bad belt burn, or perchance have a hand or arm drawn in between a running belt and pulley. The necessity for guarding chain drives and exposed gears is apparent.

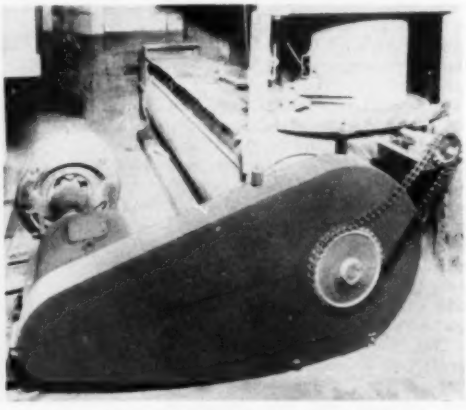
There are three different approaches to the provision of suitable power transmission guards. One of these is for the maintenance man or millwright to make and apply guards out of materials available on the market. A second method involves use of special safety guard parts, which are now available from certain sources. A third method is to specify measurements involved in a particular guard and material required, or make a drawing of the guard and contacting a firm specializing in such work.

If one chooses to make his own guards, perhaps the best material readily available for the purpose in nearly any locality is angle iron and wire mesh. The idea is to make the frame from angle iron first, bending it to required form. Smooth round bends on angle iron cannot be made with equipment readily available to the average millwright. However, angle iron can be bent after a fashion by cutting vees from the inner flange, where bends are to be made.

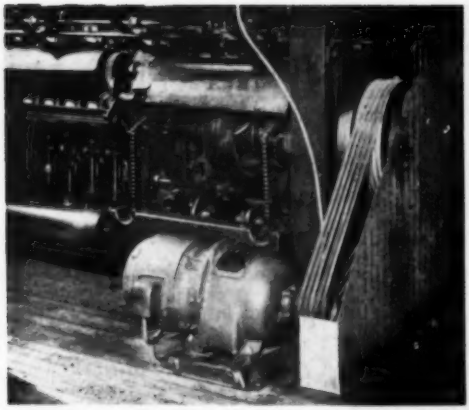
In other words, a bend must be made of a number of angles. When an angular bend of 90 deg is required, a 90 deg or square portion is cut from the inner flange of the angle iron. If the bend is to be 45 deg, a 45 deg vee is cut from the inner flange. This leaves only the outer flange of the angle iron to be bent. One may, at his option, strengthen the resulting framework by welding the edges, which come together where vees were cut out of the angle iron.

Once an angle iron frame of this type has been made, a sheet of wire mesh is laid over the top. Using a suitable heavy hand shears or light bolt cutter, one wire after the other is snipped until the wire mesh is of suitable shape and size to readily drop in-

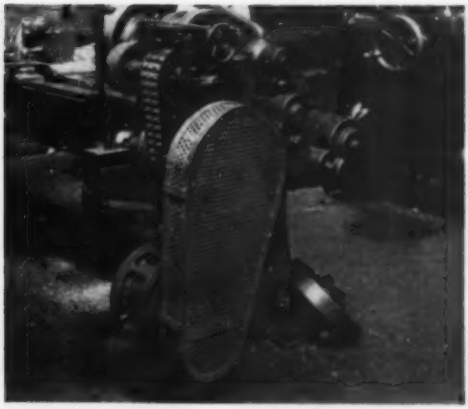
Protection can be assured by fabricating a guard from wire mesh and placing it into a properly braced metal housing



Chain guards require heavier construction, for it sometimes is employed as a member in the lubrication system



This simple guard can be formed in the tin shop, but it will not give maximum protection as the top is open



Angle iron frames and perforated sheet metal are easily fabricated into a rigid guard for small V-belt drives

to the framework. An ordinary welding torch can be employed to weld the end of each wire to the inner flange of the angle iron flange, thus making a complete composite unit, which provides one side of the required guard.

Standard safety guard parts greatly simplify the making of power transmission and other machinery guards. These can be obtained from certain sources and can be readily assembled as required. Such parts include smoothly surfaced steel sheets, perforated with round holes and slots, perforated angles and bands, gussets, floor posts and sockets. All these parts are easily assembled, as their need may appear.

So far as having guards made to order is concerned, they may be made for belts, pulleys and machinery according to blue prints, specifications or samples submitted to specialists in this line of work. Sometimes they are made of sheet metal. In other cases, expanded metal or perforated metal may be employed. Where heavier guards are needed, steel plate is quite often used. Any of these materials make a reasonably light, yet highly durable guard.

Chain guards and gear guards may also be obtained from various sources to specification. Guards for chain drives, sometimes referred to as chain casings, are often designed in such manner that the lower half is oil tight. This allows a certain amount of oil to be kept in the lower part of the chain casing so the lower strand of the chain will run through it for lubrication. In some cases, however, a disc is mounted on the shaft with one of the chain sprockets running inside the guard. The arrangement is then such that the disc throws oil to a collector plate, from whence it drains into an oil gutter, and through the gutter onto the inner side of the lower strand of running chain.

VARIABLE SPEED FOR CONSTANT PAPER TENSION

Accurate and dependable speed control on paper winders in the Combined Locks Paper Co., Combined Locks, Wis., is obtained with variable pitch motion-control drive. This unit replaced a constant speed gear drive. The company manufactures different types of paper, and each type is wound on rolls operating at varying speeds. Paper tension must remain constant and roller speeds are instantly and accurately controlled to prevent tearage.

This 30 hp, 6-groove "C" section drive using a motion-control variable pitch sheave is equipped with an idler. A conveniently located handwheel can be adjusted to increase or decrease the pitch diameter of the driving sheave, thereby permitting proper tension for any type of paper produced.

Courtesy of Allis-Chalmers Mfg. Co.

Many old industries have seen lighting develop to the modern high intensity systems which have led to extensive wiring networks. This textile mill uses a simple zone system to supply and control nearly 3000 lighting fixtures in the White Oak room

DAN McCONNELL
Plant Engineer
Cone Mills Corporation

Fig. 1—Installation of the fluorescent lighting brought illumination up to a satisfactory 65 ft-c. The 84 rows of fixtures are 12 ft apart and 12 ft high

Wiring for Modernized

LIGHTING IN A CONE MILLS WEAVE ROOM

Fig. 2 (left) — In 1908, lighting was produced by carbon arc lamps that must have caused a great deal of trouble, but gave low quantity and quality of light

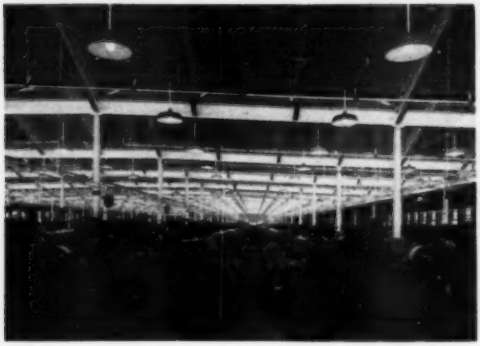
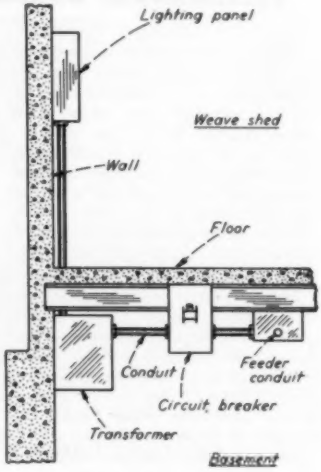


Fig. 4 (right)—The breaker protected transformers and their primary feeder circuits are in the basement. The low voltage panels supplying lighting circuits are on the wall above them in the White Oak room

Fig. 3 (lower left)—In 1928, new 500 w RLM fixtures raised illumination levels to 6 ft-c, a value now considered adequate only in non-work areas. This is now replaced by the system in Fig. 1

INDUSTRIAL LIGHTING in the Cone Mills Corporation has kept step with developments. This is well illustrated by the improvements made in the illumination of the White Oak weave shed, devoted to the production of denims. It is the largest of its kind in the world.

Lighting progress is shown in Figs. 1, 2 and 3. Fig. 2 is a view taken in



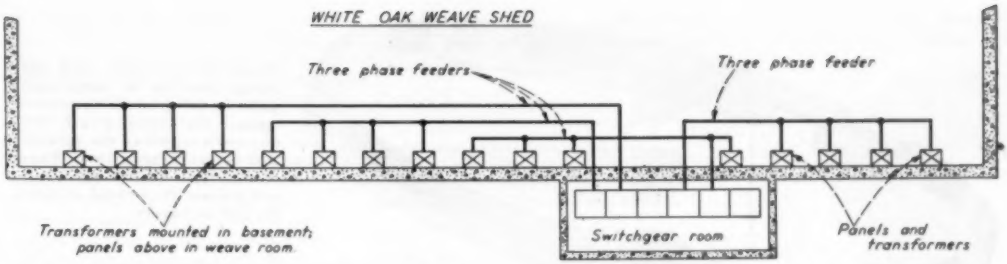

WHITE OAK WEAVE SHED
Three phase feeders
Three phase feeder
Transformers mounted in basement; panels above in weave room
Switchgear room
Panels and transformers

Fig. 5—Lighting transformers are spaced along the length of the building and grouped four to a feeder. Half of the transformers are 25 kva, the other half are 50 kva. Areas served do not overlap but installation is simple, reliable

1908 when there were approximately 1500 looms and when the lighting was by means of carbon arc lamps. Intensity of the lighting on the work is, of course, not known, but it is safe to say that it did not exceed 1 or 2 ft-c.

Fig. 3 shows the weave shed in 1928 when it had about 3000 looms and lighting consisted of 500 w RLM units which provided around 6 ft-c of illumination on the work. Fig. 1 shows the shed after modern lighting was installed two or three years ago when there were about 5200 looms operating.

Illumination is by long parallel rows of fluorescent lamps. There are three 40 w tubes per reflector and rows are at right angles to the aisles. Lighting intensity is 65 ft-c on the work. The building is divided into 16 sections, each with its individual lighting panel and transformer. This, of course, has the advantage of dividing the load and making it convenient to control the lights so as to illuminate any desired section.

As the building is 1081 ft long, a great many steps are saved by having the panels only short distances apart and in the area they serve. In addition, the former danger of the whole building being thrown into darkness by circuit failure has been greatly reduced. If trouble does occur, it is usually localized in a small section.

The panels, with their individual transformers, are divided into four groups, each group being served by a separate three phase feeder coming from the centrally located, switchgear room. Half of the transformers are rated 50 kva and serve 32 circuit panels. The other half are rated 25 kva and serve 16 circuit panels. Arrangement of the panels and the transformers with their individual circuit breakers are shown in Figs. 4 and 5. How each transformer of a group is connected with its feeder is indicated in Fig. 6.

The building is approximately 180 ft wide with saw tooth roof facing across the width and supported by pillars. There are two lines of fluorescent fixtures 12 ft apart under each roof section, and 84 lines altogether. The lights are 12 ft above the floor, arranged as in Fig. 1. Fig. 7 is a typical wiring diagram for a 16 circuit panel. All wiring is in rigid conduit.

Tube replacement has so far been on a section basis, but instructions are being developed for a planned schedule of replacements.

The job was designed by Watson and Hart of Greensboro, and the installation made by Bryant Electric Co.

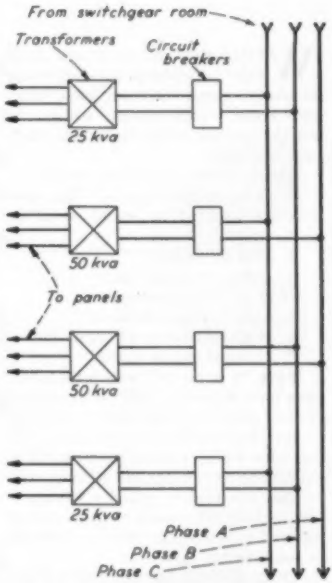


Fig. 6—Lighting transformers, grouped four to each feeder, are single phase units connected to balance phase load. Three wire circuits supply the panels

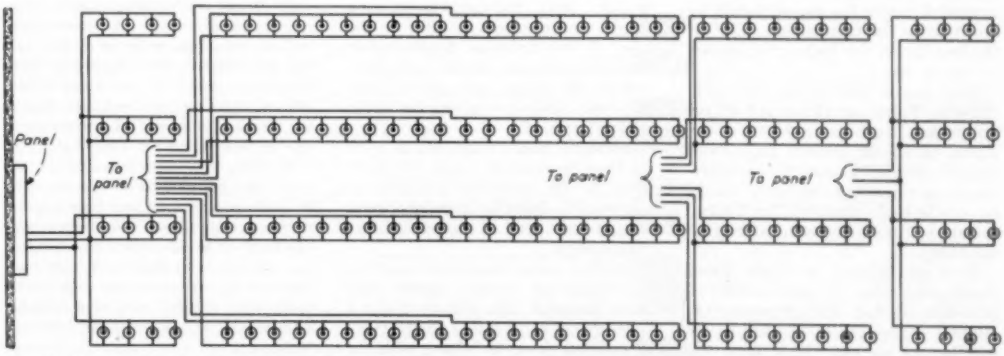
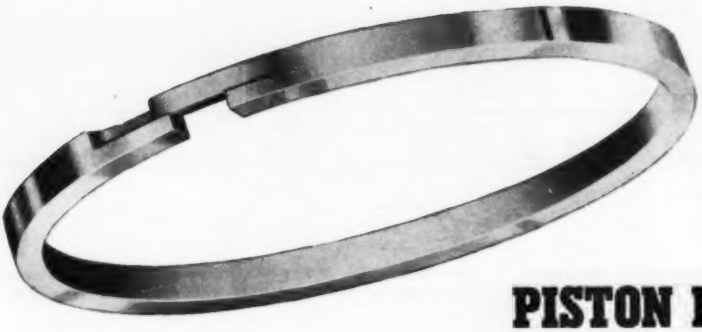


Fig. 7—This arrangement for a 16 circuit panel is typical with eight fixtures per circuit. The highly sectionalized arrangement localizes trouble and is considered adequate where output of individual machines does not affect others



Tongue across this ring gap blocks blow-by of compressed gases by being forced downward against the piston groove and outward against the cylinder wall by compression gases. Rings of this type offer a good seal and prevent the leakage of burning fuel oil vapors

PISTON RINGS

When to change piston rings and what type to install in engines are questions discussed by this author to assure efficient and economical power. Judgment and practical experience play a part in the final decision

R. W. HOYT, *Chief Engineer, Double Seal Ring Co.*

WHILE there are no *cut and dried* rules to follow in deciding when to change rings, there are good, common-sense considerations, which can tell the operator when it is time to check engine rings.

The following should be noted:

1. Compression blow-by. This may be detected by sound, smell or sight.
2. Loss of power.
3. Difficulty in starting.
4. High fuel consumption.
5. Lack of engine balance.
6. High lubrication oil consumption.
7. Unusual engine noises.

Blow-by is an evil, which the operator must fight. In addition to causing loss of power and difficulty in starting, it also destroys the lube oil film on the cylinder walls, permits metal-to-metal contact between rings and cylinder wall —that can lead to cylinder scoring— dirties lube oil, causes rings to carbon up and stick and can erode a piston to a point beyond repair.

Often blow-by can be plainly heard (a "hiss-hiss"). By lifting the cover plate at the base of the engine, the operator can smell and see the blow-by vapors. The important question at this point is how much blow-by can be permitted before the engine should be taken down for examination. One of the best checks for finding the answer is the air test.

This test is effective on four-cycle engines. Valves are closed and 80 psi air pressure is applied to the top of the piston. If the air pressure drops from 80 psi to zero in less than three seconds, the piston assembly being tested should be condemned, assuming, of course, that the valves are known to be in good condition.

This test is used on many diesel locomotives when a quick check of blow-by is needed. All pistons on a 12-cylinder engine can be checked in 15 min by the air test. How great the variation between rates of blow-by past plain open joint rings and past sealed joint rings can be demonstrated by test.

Records of one air test show that the longest periods of time required for the 80 psi to drop to zero with each of these types of rings were: new plain rings, 16 sec; new sealing rings, 26 sec.

Excess blow-by can be caused by several things. Its occurrence usually means the piston's compression rings have worn enough so that the gap between the ends of the ring has opened up excessively. Wear of 0.010 in. on the face of the ring will cause the gap of the ring to open up 0.062 in.

Out-of-round cylinders also permit blow-by. The only way a new ring in such a cylinder can stop blow-by is to wear out-of-round. Applying a high-tension ring helps in an out-of-round cylinder because this type seats-in more quickly. Also, the compression ring should not be smooth finished on the face. A fine finish of approximately 0.009 in. will give higher unit pressure on the contact area and will also help hold lubrication during the initial seating-in period.

Installing piston rings, which solve the blow-by problem, often eliminates other of the symptoms indicative of ring trouble. Stopping blow-by of compressed fuel vapor, of course, cuts fuel consumption.

Holding more compressed gases in the combustion chamber means more power potential. This gives the piston a better chance of exerting a power stroke of sufficient force to balance with the forces acting on the pistons in other *healthy* cylinder assemblies in the engine. This, in turn, means stoppage of unusual engine noises, which often result when the forces created in the various cylinders are out of balance.

Oil Consumption

Probably the most common complaint concerning piston rings is the permitting of excess lubrication oil consumption. Excess consumption not only is expensive, but it causes carbon formation and resultant stuck and broken rings along with scored cylinders.

But in trying to control oil, complete cylinder lubrication must not be forgotten. One job of the oil ring is to keep down oil consumption, that is true, but another — equally important — is to distribute a lubricating oil film properly over the cylinder wall. Therefore, do not try for lower-than-average records for minimum oil consumption. An oil consumption figure of one gallon per 3000 to 4000 hp hr has been felt to be a satisfactory minimum. Operators of older engines, however, should be satisfied with an oil consumption rate of one gallon per 2000 hp hr.

Recently the performance of 21,000 hp hr per gal of lube oil was reported by one operator who had been experimenting with rings. This shows what can be done in oil control effort, but it has not yet been shown, in this case, whether the oil savings are sufficient to justify the reduced ring and cylinder life, which is sure to result from oil starvation.

Well-experienced engine operators say the blame for excess oil consump-

tion is the operator. While this statement is an exaggeration, it has considerable merit. For instance, overloading engines is probably one of the greatest causes of piston ring wear, which leads to excess oil consumption.

An engine can be run at 80 per cent of its rated power for years without trouble, but operating at 10 per cent above rated power might cause several kinds of trouble. Perhaps one of the reasons for this is engine manufacturers, because of competition, have rerated their engines higher than advisable for conservative operation.

Checking Roundness

Before installing new rings, good practice calls for checking the roundness of a cylinder and it should be round within a few thousandths of an inch — if a good compression holding job is expected. In addition, the roundness of the rings to be applied should also be checked. This can be done best in a cylinder that is known to be absolutely round.

Tests should be made in this manner:

Place a 40-w light inside the cylinder at the bottom. Insert the ring and cover the inside diameter of the ring with a circular piece of cardboard. Sight between the ring and cylinder wall and try to see a glint of light.

If both the cylinder and ring are sufficiently round, probably a "fuzzy" line of light will be seen in spots or even all around. This will be satisfactory because these small variations will wear to a good seat in the first hour of running.

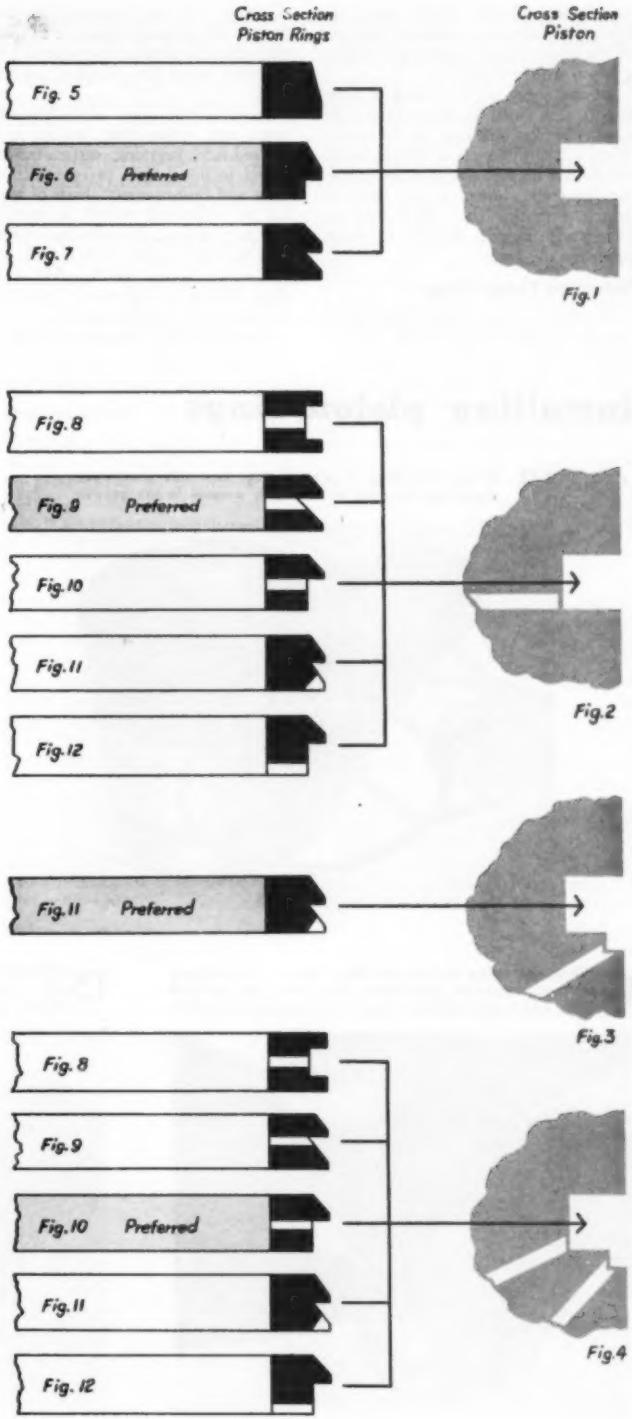
Any clear light that can be "shut off" by pressing outward lightly with the fingers on the inside of the ring should not be considered indicative of excess deviation from ring roundness.

When clear light appears between the ring periphery and cylinder wall, check to see what size feeler gage can be inserted in the opening. The greater the ring diameter, the larger tolerance for the size of opening.

Light is deceptive, and a line of clear light might appear large enough to take a 0.005-in. feeler. Therefore, check with the feeler, because, with the testing setup described above, a 0.001-in. width of light appears to be at least 0.005 in.

If the cylinder is not round enough to check the roundness of rings as described above, obtain a ring checking sleeve. When several engines are involved and ring checking is necessary, making a good sleeve is a necessity.

A sleeve for testing 14-in. rings should have a radial thickness of at least two inches and should be about two inches wide (from "top" to "bottom" of the sleeve). When the sleeve is made into an "L" shaped cross sec-



tion, it will hold its shape. Stress relieving the sleeve is essential, because of the close tolerance when working to a round within 0.0005 in.

In any event, a 14-in. ring is satisfactory if a 0.001-in. feeler cannot be inserted between the ring and the sleeve. With a 21-in. ring, a 0.002-in. feeler should not be able to enter. In inserting the feeler, however, care must be exercised so that the ring is not inadvertently moved inward to make room for the feeler.

Selecting Piston Rings

Types of piston rings best suited for certain jobs have a wide field of selection. In the compression ring family, for instance, there are so many types that the average ring user is a bit confused when he considers the vast array.

Some of the types of compression rings are: plain-joint, sealing-joint, tapered-face, keystone, surface-treated, plated, torsional-twist, two-piece, three-piece and bronze-insert. Each of these has its individual merits in meeting specific problems. If individual experience with the engine or engines is not sufficient to guide one in selection of rings, calling for the advice of a ring manufacturer is advantageous.

Basically, the plain cast-iron ring is probably the "most" for your money if your engine is in good condition and when average performance would be satisfactory. When the cylinders are out-of-round, tapered or slightly oversize, the one-piece joint sealing ring will give the most economical service. That is, while the sealing ring generally costs more than the plain ring, increased engine efficiency gained by using the former usually more than offsets the added ring cost.

There are just as many (or more) types of oil rings as there are compression rings. Basically in oil rings, the narrower the scraping edge, the higher the unit pressure against the cylinder wall and the better job of scraping oil from the wall.

Oil ring choice is limited by the type of oil ring grooves in the piston. There are four general types of oil ring grooves:

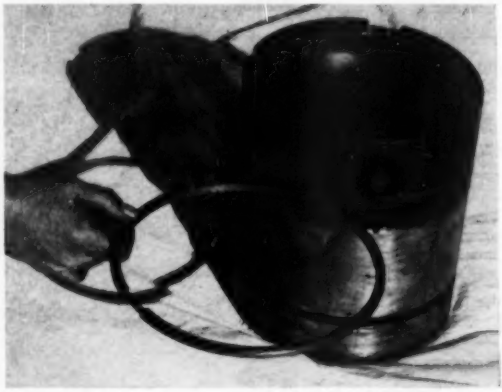
1. A plain groove with no provision for oil drain. (Fig. 1) The ring for this groove can be a plain beveled ring (Fig. 5), a beveled and grooved ring (Fig. 6) or a double scraper ring (Fig. 7).

Since there are no drain holes in this type of oil ring groove, there is no necessity for ports or slots in the ring inserted in this groove. In fact, using slotted rings is harmful in grooves which are not drilled for oil drain. These slots lessen the ring cross sectional strength, and to some extent reduce the outward push of the ring against the cylinder wall.

A ring such as is shown in Fig. 6 is recommended for Fig. 1 groove. This ring, which has no ports or slots, has a bevel at the top that permits it to ride over the oil on the cylinder wall during the upstroke. It has a good scraping edge and a lower groove,

installing piston rings

13 ***Before installing a piston ring, the side clearance should be checked by rolling it around in the groove***



14 ***When installing a ring by hand do not over-stress through excessive expansion. Note the side marked TOP, which must always face the combustion chamber***

15 ***Utilization of thin steel straps, as illustrated, will facilitate the proper spreading and sliding of the ring over the piston and into the grooves***

which has good oil accumulating capacity .

2. A groove provided with oil drain holes. (Fig. 2) Several types of rings are (Fig. 8 through 12) suitable in this type of groove. All of these rings have ports or slots that permit oil to drain through the ring and down through the drain holes in the piston. Any of these rings is also suitable for use in the type of groove shown in Fig. 4.

Rings in Fig. 8, 9 and 10 progressively give more oil control in the Fig. 2 groove. General recommendation is to utilize the ring illustrated in Fig. 9. This ring will give a combination of good oil control and long ring life.

3. A groove with drain holes in the lip below the groove. (Fig. 3) This groove does not, of course, require a slotted ring. The best oil control ring for this groove is Fig. 11—a double scraper ring with ports cut across the lower scraping edge to permit oil to flow from the accumulator groove past the lower scraping edge and through the drain holes in the pistons.

4. A groove with two sets of drain holes, one set in the groove and another in the lip below the groove. (Fig. 4) These sets of holes are staggered radially in order not to weaken the piston. Rings in Fig. 9 and 10 are suitable for use in this groove.

Should oil consumption be a problem, the ring in Fig. 10 provides more drastic control. This ring has a very high unit pressure and is sometimes used with a crimped type ventilated expander behind it to increase the pressure further.

Recent tests confirm the need for an additional oil ring above the pin on four-cycle engine pistons fitted with ventilated oil rings. These ventilated oil rings carry a considerable amount of oil with them on the piston upstroke. This oil gains considerable momentum on the upstroke and because of inertia continues upward as the piston starts downward.

An additional oil ring such as that in Fig. 6 will help to control this oil. The problem is where to obtain the necessary extra groove in which to place this oil ring.

The lowest compression ring can be practicably replaced with an oil ring when sealing type compression rings are installed in the two top compression grooves. Extensive field tests have shown that two sealing rings do a better job of holding compression than three or four plain open joint rings.

Installing Rings

Preparation for installing rings should include removal of all carbon from grooves and oil drain holes in the pistons. Grooves should be inspected for taper and remachined if necessary. The pressure (or bottom) side of the grooves must be flat and square, or the best ring made cannot do its job properly.

Check each ring in the smallest part of the cylinder in which it is to function. Make sure the end clearance for all compression rings and sealing type oil rings is not less than 0.005 in. per inch of cylinder diameter and for plain oil rings is not less than 0.003 in. per inch of cylinder diameter. Check side clearances by rolling each ring around the groove. Be sure the ring drops below the surface of the piston.

Place the ring side marked "top" nearest the pressure chamber. Whether the ring is spread by a mechanical expander or by hand, the installer should be careful not to over-stress the ring, expanding it only enough to allow the ring to slide over the piston easily.

Placing rings in boiling water before spreading them over pistons causes them to expand slightly and seems to make the iron more pliable. Thus the ring is subjected to less stress in being spread over a piston.

If the ring is being spread and installed without a mechanical expander, the operation would be facilitated by use of thin steel straps. (Fig. 15) When using a mechanical expander, be sure the jaw does not bear on the tongue of a sealing type ring. (Fig. 16)

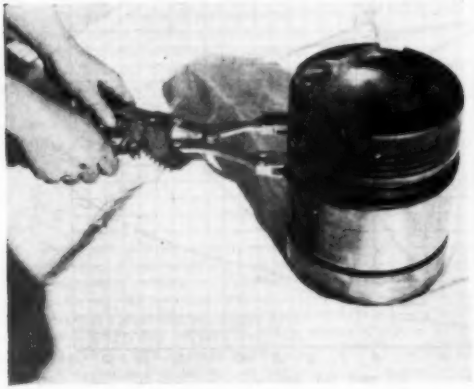
Rings should be oiled and rotated on the piston as a further test that they are flat and free, and that no wavy spots or carbon lumps are in ring grooves. Before inserting the piston, mop the cylinder liner thoroughly with lubrication oil. Use an entrance sleeve to install the piston. Watch carefully to see that the rings do not hang and become distorted while the piston is being lowered.

Storing Rings

Permanent damage can be done to piston rings in handling and storage, as well as in installation. Because most piston rings are made of close-grained, high graphitic content cast iron and have a small cross section compared to diameter, considerable care is necessary to avoid warpage, especially during storage. For proper storage, rings should be laid flat on a smooth surface. Stacks of rings should not be more than 12 in. high so that excess weight will not bear on rings at the bottom.

Rings not given rust-preventive treatment by the manufacturer must be given such treatment before storage.

16 ***One precaution in employing a mechanical expander is to make sure the expander jaw does not cause damage by bearing on the tongue piece of the ring***



17 ***Installed rings should be oiled and rotated to determine if they are flat and free and that no WAVY spots or carbon lumps are in the piston grooves***

CHARACTERISTICS OF NET POSITIVE SUCTION HEAD ABOVE VAPOR PRESSURE

Suction conditions play an important factor in the proper selection of a centrifugal pump. This author explains the general characteristics of the net positive suction head above vapor pressure as a sensible means of evaluating pressures, specific gravity and heads

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Centrifugal Pump Dept., Allis-Chalmers Mfg. Co.

ONE of the most important factors in centrifugal pump selection, and—strangely—one of the most often ignored, is a complete description of suction conditions. In this factor, all elements contributing to the energy head condition at the pump intake are brought together into a usable quantity called "net positive suction head above vapor pressure". The result has a strong influence on the performance, cost and life of a pump for a particular application. For this reason, NPSH (as it is abbreviated) should be better understood by pump users to make sensible investments in centrifugal pumping equipment.

Total Energy

Specifically, NPSH is a factor obtained by combining atmospheric pressure (or the pressure in the suction vessel), vapor pressure and specific gravity of the liquid pumped, elevation head and the friction head (both on the suction side) during normal operation. Its purpose is to show the total energy head available at the pump intake for replacing liquid, which is expelled from the pump casing during operation.

While centrifugal pumps are designed to certain head and capacity ratings, relatively few realize that these same pumps have a minimum NPSH characteristic below which they will not function properly. These ratings are established by test for each pump over a range of capacities in the normal limit of the pump's performance. NPSH for a particular installation is calculated and compared to the minimum NPSH for the pump at the desired capacity. When the former point falls below the point established by test, insufficient energy head will exist at the pump intake to maintain desired capacity.

Theoretical maximum suction lift from an open vessel of cold water is about 34 ft, and this is only at sea level. Losses at the pump inlet reduce this somewhat—as do losses incurred by a change in altitude. In addition, even at average temperatures, water has enough vapor pressure and variation in specific gravity to reduce the ideal to 33 ft maximum lift. This is the figure normally used by pump manufacturers as a basis of calculation.

Common Denominator

Since very few applications involve pumping under all-standard conditions, publishing tables with all possible combinations of conditions would be impossible. The NPSH factor is used as a common denominator between the actual conditions at the installation, and those that revealed the performance of the pump under test.

Formula for determining available NPSH of a proposed installation is:

$$NPSH = \frac{2.31\ (P_A - P_V)}{Sp\ Gr} + H_S - H_F$$

Where:—

P_A — Atmospheric pressure or pressure in the suction vessel

1. This factor is particularly important when the pump is operated at high elevations above sea level. It decreases from 14.7 psi or 34 ft at sea level by approximately one foot for every 1000 ft increase in altitude.

2. When the suction tank is enclosed and is an evaporator or vacuum vessel, P_A will equal P_V and the entire first term of the formula becomes zero.

3. When the pump takes suction from a pipe line coming from a booster pump, the calculated pressure at the "new" pump's suction, resulting from the booster pump, gives this quantity.

Vapor Pressure

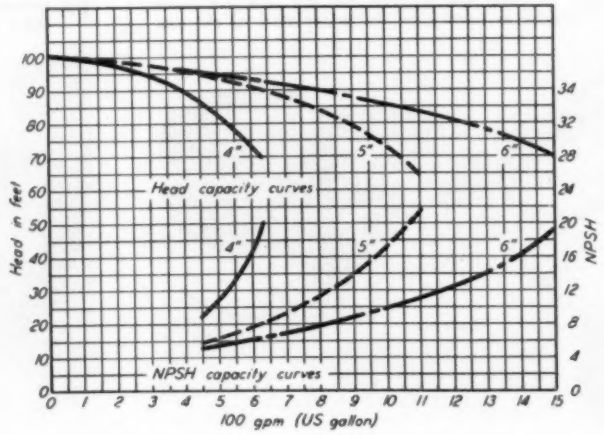
P_V — Vapor pressure of the liquid at maximum pumping temperature

1. Wherever possible, the prospective purchaser should be very certain of the accuracy of this information, for it can change very rapidly with temperature variations.

2. The main reason for using NPSH as a measure of suction conditions and assumptions should be avoided wherever possible.

Sp Gr — Specific gravity

When an unusual liquid is to be



handled this value should be as accurate as possible and based on pumping temperature.

H_E = Elevation head

1. When static measurements are positive, this is a positive factor. (Suction head)

2. When static measurements are negative, this is a negative factor. (Suction lift)

H_F = Friction head

This can usually be obtained from tables such as those published by the Hydraulics Institute as part of their Standards.

Application

Consider a typical application of NPSH as it affects the selection of a pump. Fig. 1 shows head and NPSH curves plotted against capacity for a group of three similar type pumps, any one of which could meet a required rating of 600 gpm against 70 ft head. Assume, however, that the installation has a maximum available NPSH of 10 ft. Fig. 1 indicates that the 4-in. pump requires 17 ft NPSH to pump 600 gpm, and that with 10 ft available will only pump a maximum of 475 gpm. If this 7 ft difference cannot be made up by relocating the equipment to change the H_E and H_F factors, a 5-in. pump should be selected.

If, for some reason such as seasonal water levels or change in temperatures, there is a possibility that the NPSH will drop to 7 ft., it would be wise to select the 6-in. pump.

Limitations

NPSH limitations are, as previously stated, determined by the pump manufacturers on the basis of tests. Pump manufacturers also are guided by a set of limitations, gathered by mutual experience, that establish the minimum NPSH requirements, which should permit operation of centrifugal pumps without cavitation. Cavitation is a particular kind of non-abrasive wear, which takes place when centrifugal pumps operate with inopportune suction conditions and should be avoided in good pumping practice.

Proper analysis of suction conditions in the form of correct available NPSH information cannot be stressed too strongly. When the supplier is made to assume the conditions under which the pump will operate, the performance, cost and life of the pump will usually reflect this fact.

DON'T CLIP—DON'T TEAR

WRITE FOR TEAR SHEETS!

Rather than spoil this issue for other readers in your plant, let us supply you with copies or tear sheets of any of the articles for your files. Just drop a line to the editors, preferably on company letterhead, for articles desired

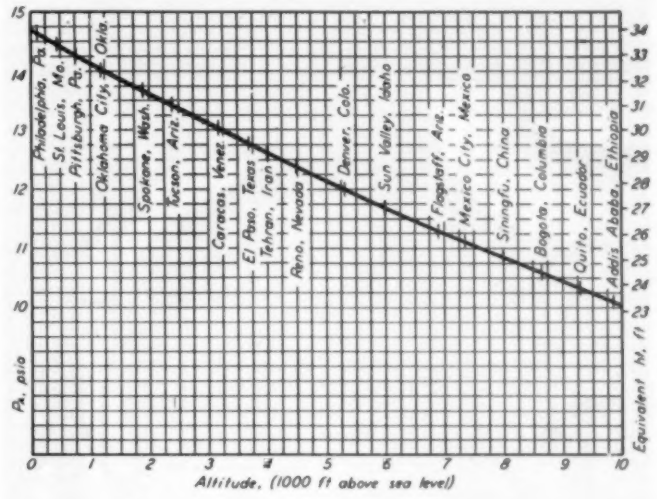


Fig. 2—Atmospheric pressure varies considerably because of elevation above sea level. When determining the NPSH by means of the formula, P_A should be taken from this line curve. Knowing the elevation above sea level permits a direct reading in pounds per square inch or equivalent height in feet

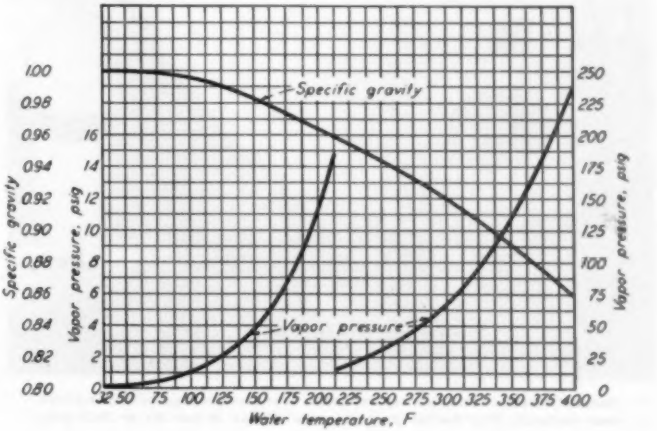
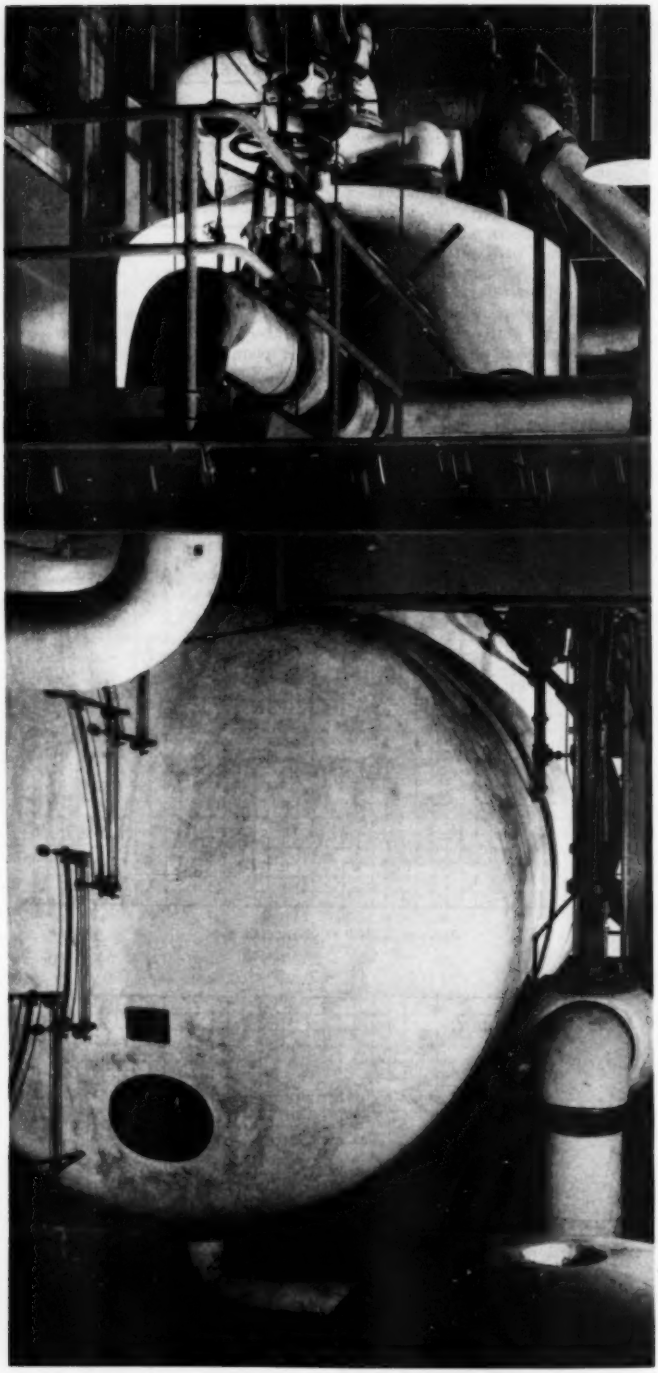


Fig. 1—Range of capacity in the normal limit of 4, 5 and 6 in. pump performance. NPSH for a particular installation is calculated and compared to the minimum for the pump at desired capacity. When the calculated point falls below the curve, the energy head at the pump intake will be sufficient to maintain the required overall capacity

Fig. 3—Vapor pressure and specific gravity curves of water at various temperatures will give direct values of P_V and Sp Gr in the formula. For water temperatures below 212 use vapor pressure curve and scale at left. For temperatures above 212 explore the vapor pressure curve and scale on the right



Deaerators remove temporary hardness, vent dissolved gases and improve heat balance. This heater processes one million lb per hr at 46.2 psig

INDUSTRIAL

WATER, one of the most widely used of all substances, has many important applications as an industrial material. Probably the most important usage in industry occurs in the generation of steam power, although water is also employed extensively as a coolant. It is utilized as a solvent in chemical processing, serves as an ingredient in concrete and plasters, and is a raw material for chemicals such as salt, chlorine, caustic soda, hydrogen, oxygen, bromine, iodine and magnesium.

The amount of water used in various processes is enormous. For example, in the manufacture of some chemicals, as much as 300 lb of water may be required per lb of finished product. It takes 5,000,000 gal to recover a ton of bromine and 300,000 gal for a ton of magnesium. In the manufacture of synthetic rubber, 600,000 gal are needed per ton of product, while each ton of smokeless powder requires 50,000 gal of water.

Daily ground water usage in 1945 was distributed as follows:

	Billion gal
Irrigation	10
Industrial	5
Municipal	3
Rural	2

Industry used part of the three billion gal listed as municipal consumption besides the five billion gal pumped from its own wells. Ground water actually constitutes only about 20 per cent of the total amount consumed, as about 125 billion gal of surface and underground water are used daily, or about 800 gal per person per day.

Water Supply

Although most of the United States has an abundant supply of water, some parts of the country are less fortunate in this respect. Two man-made problems, ground water depletion and stream pollution, have aggravated this situation in congested industrial areas. Serious industrial water problems have arisen in Texas, Southern California, Indiana, New York, New Jersey, Kentucky, and elsewhere. Decreasing supplies and the expense of eliminating pollution have been steadily increasing the cost of water. While purified water costs only about five cents a ton, it is nevertheless expensive because of the huge quantities used. Often the controlling factor in the location of an industry may be the amount and quality of water available.

WATER UTILIZATION

Industry requires vast quantities of water for manufacturing operations and the production of utility services. Dissolved or suspended impurities contained in the water often present complicated problems that must be corrected by treatment

MELVIN NORD, *Associate Professor of Chemical Engineering, Wayne University, Detroit, Michigan*

Sources of Water

The primary source of all water is, of course, rainfall. Rain falling through the air dissolves various gases and picks up some dust, but is nevertheless the purest natural water obtainable. When rain reaches the earth, it may run off the surface of the land in the form of streams, seep into the ground to become underground water, or evaporate. Since water is a universal solvent, the purity of surface and underground water is substantially lower than that provided by rain water.

The availability of water varies because of seasonal and annual differences in rainfall. The concentration of impurities will also vary with rainfall, since the percentage of purer surface water entering streams will be decreased during periods of dry weather.

Water seeping into the ground percolates slowly downward eventually filling all the pore space in the ground. The top surface of the layer, which is saturated, is called the water table, while at greater depths, underground water may be obtained from springs or wells. A spring may occur on the side of a valley that has been eroded below the level of the local water table, or where a layer of impermeable rock causes the water seeping downward to flow horizontally. Wells are dug below the level of the water table, so that appreciable quantities may be extracted.

Both surface water and underground water contain more impurities than rain water, but the types of impurities are generally different. Surface water carries appreciable quantities of suspended solids, which have been picked up by erosion, as well as dissolved solids. Underground water generally contains more dissolved solids and less suspended solids than surface water, because of the greater contact with minerals and the filtering action of the soil. In general, ground water is less desirable than surface water for industrial purposes because of the increased content of dissolved solids, but it may be as satisfactory for sanitary purposes because of the decreased content of suspended solids.

Suspended solids in water include mud, clay, sewage, and industrial wastes. These impurities may cause corrosion and scale deposits in boilers and other heat-exchange equipment. Finely divided suspended solids may also cause foaming and priming. Dissolved impurities usually consist of carbonates, bicarbonates, chlorides and sulfates of calcium, magnesium, and sodium but smaller amounts of silica, iron, and alumina may also be present. Waters that have been in contact with limestone or gypsum are "hard", and those from limestone containing magnesia are corrosive and scale-forming.

Hardness of water is caused by the presence of calcium and magnesium ions. When soap is added to hard water, it does not form a lather, because it reacts with the calcium or magnesium ions to form an insoluble soap, which precipitates out of solution. Thus, before a lather can be formed, sufficient soap must be added to react with all the calcium and magnesium present in the water. If these ions are present in the form of bicarbonates, the hardness is temporary and can be removed by boiling, in which case calcium and magnesium carbonates are precipitated.

$$Ca(HCO_3)_2 \longrightarrow CaCO_3 + CO_2 + H_2O \quad (1)$$

$$Mg(HCO_3)_2 \longrightarrow MgCO_3 + CO_2 + H_2O \quad (2)$$

Permanent hardness, generally caused by sulfates of calcium and magnesium, cannot be removed by boiling.

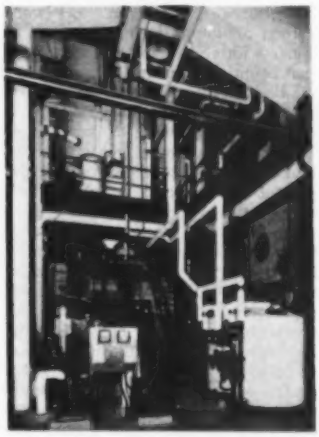
Quality of Water

For all industrial installations, the quality of the water is as important as the quantity available. For cooling purposes, quality primarily means temperature, while for steam power purposes, quality means purity.

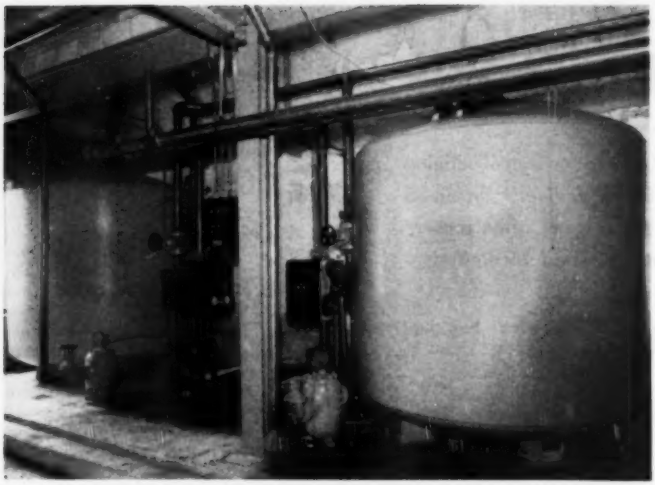
In processes where water is used for cooling purposes, the temperature of the water is extremely important and has a great effect on the design of heat exchangers and condensers. Often the temperature of the cooling water is critical. For example, if water is used in a barometric condenser, the vacuum obtainable is limited by the water temperature. Generally the temperature of surface water follows the temperature of the atmosphere. On the other hand, water from deep wells ordinarily has a lower and more uniform temperature than surface water, and is therefore more desirable for cooling purposes.

For boiler feedwater and many other industrial applications, the purity of water is a very important factor. A perfect boiler feedwater is one that will not form scale or cause corrosion, foaming or priming. This quality is rarely available in natural water, and hence purification of boiler feedwater is generally required in most cases.

Both dissolved and suspended solids in boiler feedwater tend to form scale. As the water evaporates, the dissolved material becomes more concentrated and eventually crystallizes out of solution. Solids also may be precipitated out chemically as previously shown by reactions (1) and (2), where bicarbonates decompose to yield less soluble carbonates which precipitate out. The scale formed may vary in hardness from a soft mud that can be flushed out of the boiler by blowing-down to a hard cement-like material which is difficult to remove. Feedwaters high in calcium sulfate or colloidal matter, such as silica, contribute to the formation of dense scale. Calcium sulfate is especially troublesome, forming hard scale which attaches firmly to boiler



Most power plant installations include systems for boiler feedwater treatment



The calcium and magnesium ions that cause hardness are often removed in base exchange softeners. Dual units are used for continuous operations

tube walls. The reason for this is the inverted solubility curve of calcium sulfate. Unlike most substances, its solubility decreases as the temperature increases and therefore tends to crystallize out at the hottest place. Since scale is essentially a heat insulator, heat transfer becomes reduced thus lowering the thermal efficiency of the boiler and causing operating difficulties. When the heat transfer through the wall of the tube is decreased, the outside of the tube, exposed to the products of combustion, becomes overheated and will eventually burn out. Furthermore, plugging of the tube with scale before it burns out, retards circulation aggravating the situation.

Corrosion is one of the most serious effects of impurities in boiler feedwater with acidity and dissolved oxygen being the principal characteristics tending to cause this condition. Experience indicates that dissolved oxygen is the greatest accelerator of corrosion in boilers and accessories and must be reduced to a minimum. Free acids may be present due to stream pollution from mine waters or industrial wastes or because the water contains certain salts, such as $Mg\ Cl_2$, that will hydrolyze to form hydrochloric acid. Sodium salts, such as NaCl, are not generally objectionable as they are too soluble to crystallize out and do not ordinarily hydrolyze but NaCl in the presence of $MgSO_4$ forms $MgCl_2$ which hydrolyzes to yield an acid. The presence of high concentrations of salts may also accelerate electrolytic action. Although feedwater is rendered less corrosive if it is slightly alkaline, too much alkalinity may cause caustic embrittlement. Combinations of stressed metal, such as at punched rivet holes, and high concentrations of alkali have led to this type of corrosive failure.

Foaming is the formation of bubbles at and above the surface of the water. If these bubbles persist, the foam level will rise, and liquid water may be carried over with the steam. Priming also causes carry-over and is usually considered a more severe condition as larger amounts of water are injected into the steam lines. Nearly all dissolved or suspended impurities tend to cause foaming or priming. Since the concentration of solids increases as the water evaporates, foaming becomes excessive unless the highly concentrated water is blown off periodically and replaced by fresh water. Foaming and priming cause dirt to be carried by the steam, causing loss of efficiency and increased maintenance costs.

Sedimentation

The first step in water treatment is the removal of suspended solids if they are present. This may be accomplished by sedimentation, with or without the addition of chemical coagulants, or by filtration. When water containing suspended solids is kept in a quiescent state in a storage tank or reservoir, the solids gradually settle out. Sedimentation may be achieved either in tanks where the water is kept perfectly still, or in tanks through which water continually flows. The maximum removal of solids is obtained in the former case. In the latter case, the basin should be designed to eliminate eddy currents and scouring velocities that would tend to prevent settling. Settling times greater than one day are rarely warranted since the removal of solids by this method is not complete and should be followed by some more efficient process. However, the savings effected by this process, reduction in cost of chemical coagulants and decreased cost of filters, will often warrant the use of sedimentation, particularly when the turbidity of the water is high.

Chemical Coagulation

Very fine particles will not settle out for a long time, since the slightest convection current is sufficient to overcome their slight settling tendency. Settling of these particles may be greatly accelerated by adding chemicals that cause the particles to coagulate or form flocs. The usual coagulant chemicals are salts of iron or aluminum, which form a gelatinous precipitate of the hydroxide. These gelatinous particles enmesh suspended impurities, forming larger aggregates that settle out rapidly. Sufficient time must be allowed for the reaction and coagulation, several hours usually being sufficient. This process generally removes about 90 per cent or more of the suspended solids, and not only accelerates settling, but also hastens and improves filtration. Consequently, coagulation is often employed as a stage of purification preliminary to filtration.

Filtration

When settling with or without coagulation is incomplete, filtration may be used to remove suspended solids. One filtering medium is sand, although other materials are also used.

Two principal types of filters are utilized, gravity filters and pressure filters. In each case, the water passes downward through a bed of sand and gravel supported on a strainer and discharges from the bottom of the unit. The bed is washed out from time to time by reversing the direction of flow. Gravity filters are open tanks, while pressure filters are closed steel tanks connected to a water main under pressure. Advantages of pressure filters over gravity filters are the decreased space required and the fact that, in an emergency, the output may be more than doubled by raising the pressure.

Heating and Deaerating

Where exhaust steam is available, a considerable saving in heat may be effected by using it to preheat the boiler feedwater. In addition, preheating accomplishes two different types of purifying effect, removal of temporary hardness and removal of dissolved gases, such as oxygen and carbon dioxide, which is called deaeration.

When water is heated, calcium bicarbonate decomposes, liberating carbon dioxide and precipitating calcium carbonate. Magnesium carbonate is more soluble than calcium carbonate, and a considerable amount of magnesium will therefore remain in solution. Thus, while feedwater heating accomplishes a partial softening of the water, further softening by chemical treatment is still necessary. However, the amount of chemicals required is reduced by feedwater heating.

As the temperature of the water is increased, the solubility of gases decreases. A decrease in absolute pressure by the application of vacuum similarly reduces the solubility of gases in water. At the boiling point of water, for any given pressure, the solubility of oxygen in water is nil. This does not necessarily mean that merely heating water to its boiling point will remove all gases completely, for the gases may remain trapped in the water to some extent unless they are mechanically released. The principal purpose of deaeration is the removal of dissolved oxygen, since this is the most important single factor in corrosion of metal by water.

Deaerating can also be accomplished by mechanically scrubbing air out of boiling water, or by causing the oxygen to react with iron or steel contained in a tank. The latter method has not been used widely in this country for boiler feedwater preparation, although it is utilized to reduce the corrosive properties of hot water in heating buildings and for other applications.

Chemical Softening

Water softening by chemical treatment involves the conversion of soluble impurities to insoluble forms. They are then precipitated and removed by settling or filtration.

The most widely used chemicals for boiler feedwater softening are slaked lime and soda ash. The addition of lime converts calcium bicarbonate to carbonate, and magnesium bicarbonate to magnesium hydroxide.

$$Ca(HCO_3)_2 + Ca(OH)_2 \longrightarrow 2CaCO_3 + 2H_2O \quad (3)$$

$$Mg(HCO_3)_2 + 2Ca(OH)_2 \longrightarrow 2CaCO_3 + Mg(OH)_2 + 2H_2O \quad (4)$$

Removal of hardness other than that due to bicarbonates, such as sulfates, chlorides and nitrates, is accomplished by converting these to insoluble carbonates by adding sodium carbonate.

$$CaSO_4 + Na_2CO_3 \longrightarrow CaCO_3 + Na_2SO_4 \quad (5)$$

Other impurities such as aluminum and iron are precipitated as hydroxides by the lime-soda method of treatment.

As a result of the lime-soda treatment, the scale-forming substances are replaced by the corresponding soluble sodium salts. Where this leads to too high a concentration of dissolved sodium salts, an alternate method is to use barium carbonate instead of sodium carbonate. In this treatment, a considerable part of the barium is removed as barium sulfate, thus reducing the concentration of dissolved salts. The disadvantage of barium is its cost.

Another chemical sometimes used after the lime-soda treatment, or in place of soda ash, is tri-sodium phosphate. The advantage of this chemical is that the solubility of phosphates is generally lower than that of carbonates or sulfates. Another advantage claimed for phosphates is that they are less likely to cause excess alkalinity.

The velocity of water softening reactions increases considerably as the temperature is increased, and the settling rate is faster because of the decreased viscosity. Raising the temperature from 50 to 210 F results in a greater reduction in hardness in 10 min than would be obtained in five hr at the lower temperature. In addition, heating the water to its boiling point helps to reduce temporary hardness with a saving in lime, and also makes deaeration possible at the same time.

Ion Exchange Softening

The first method of softening water by ion exchange used certain natural salts called zeolites, of the general composition $Na_2O \cdot Al_2O_3 \cdot 4SiO_2 \cdot 2H_2O$ usually abbreviated Na_2Z. When water containing calcium or magnesium ions is passed through a solid bed of zeolites, the calcium and magnesium ions react with the zeolites, liberating sodium ions.

$$Ca + Na_2Z \longrightarrow 2Na + CaZ \quad (6)$$

The zeolite is contained in a pressure vessel in the form of a filter bed. Operation is similar to that of a filter, although the process is altogether different in principle. Turbid water must not be admitted to the zeolite bed, as it coats the zeolite grains, preventing the water softening reaction from occurring. As the softening process continues, the sodium zeolite gradually becomes transformed into calcium zeolite, after which time it will no longer be capable of softening water. Most installations stop the flow as soon as any hardness is found in the water leaving the bed. It is not necessary to discard the zeolites at this point, since they can be regenerated by reversing reaction (6). When flow is reversed, strong brine solution replaces the water, thus restoring the zeolite to its original form as the calcium chloride is soluble and washes out. At the end of the regeneration process, the brine is washed out with water, and the equipment is again ready for service.

Zeolite installations have proven very successful for many applications including boiler feedwater treatment. In this case, a double unit is preferred so softened water can be supplied by one exchanger while the other is being regenerated. An alternate arrangement employs one softener but pro-

This photograph shows a deaerating hot process softener that includes electrically controlled chemical feeds, sedimentation tank and filter

vides sufficient treated water storage capacity to supply requirements during regeneration of the softener.

Artificial zeolites have now been prepared that are more efficient than the natural zeolite, while several other substances of entirely different chemical structure have been found which also serve as ion-exchangers. Certain carbonaceous materials and synthetic resins may be used for this purpose, and zeolites are also available that replace calcium and magnesium ions with hydrogen ion. These are hydrogen zeolites, and give the following typical reactions:

$$CaSO_4 + H_2Z \longrightarrow CaZ + H_2SO_4 \quad (7)$$

$$Na_2CO_3 + H_2Z \longrightarrow Na_2Z + H_2CO_3 \quad (8)$$

Hydrogen zeolites are particularly advantageous for treating water which contains carbonates and bicarbonates. The carbonic acid formed may be removed by deaeration, and thus both carbonates and bicarbonates can be completely removed from the solution.

In general, water softened by hydrogen zeolites will be acid, as indicated by equation (7). Soft water of this type is especially corrosive since no protective coating of scale is formed to protect the metal. On the other hand, water treated by the sodium zeolite method will generally be alkaline, because of the presence of sodium carbonate or bicarbonate. It is therefore common practice in treating boiler feedwater by the zeolite method to use hydrogen and sodium zeolite units in parallel, blending the two products in the desired proportion to maintain the desired degree of alkalinity.

The sodium and hydrogen zeolites discussed above are cation exchangers where one cation replaces another. Zeolites are also available that exchange anions and by using a combination of both types, dissolved salts can be completely removed leaving a product which is practically the same as that obtained by distilling water.

Evaporation and Distillation

In power plants where exhaust steam is condensed in a surface or closed condenser, the condensate is distilled water. If the amount of make-up water to be added constitutes only a small portion of the total feed, say less than 20 per cent, it is often feasible to evaporate or distill the make-up in a separate unit. In this way the feedwater will be very pure, virtually eliminating scale formation and the necessity of blowing down the boiler.

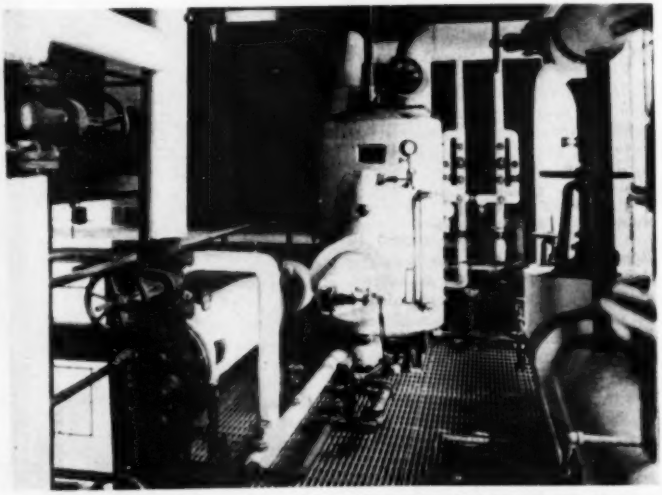
The conventional equipment used for distilling water for power plant usage is the evaporator. In principle, this is simply a tank equipped with steam coils or tubes for heating the water until it vaporizes. After leaving the evaporator, the vapors go to a condenser before entering the boiler as feedwater. Steam requirements for this operation may be reduced by the use of multiple-effect evaporators where the vapors formed in the first effect are used in the heating coil of the second effect, which is maintained at a lower pressure. This may be repeated, in which case the arrangement becomes a triple-effect evaporator. Vapors leaving the last effect are condensed in a barometric condenser that provides the required pressure reduction. In principle, this method would appear capable of evaporating 3 lb of water per lb of entering steam, but due to temperature drops in each stage, the result is generally about 2.5 lb for a triple-effect and 1.8 lb for a double-effect system.

A new method called compression distillation has recently been devised that is particularly adaptable to the evaporation of water. In this method, heat is supplied, except when starting up, by mechanical means in the form of compression of vapors. In this process, vapors from an evaporator are compressed, the heat of compression raising their temperature sufficiently to permit them to be returned through a steam coil in the evaporator to boil additional water. The steam condenses when it gives up its latent heat, and it is then cooled in a preheater by the incoming water entering the evaporator.

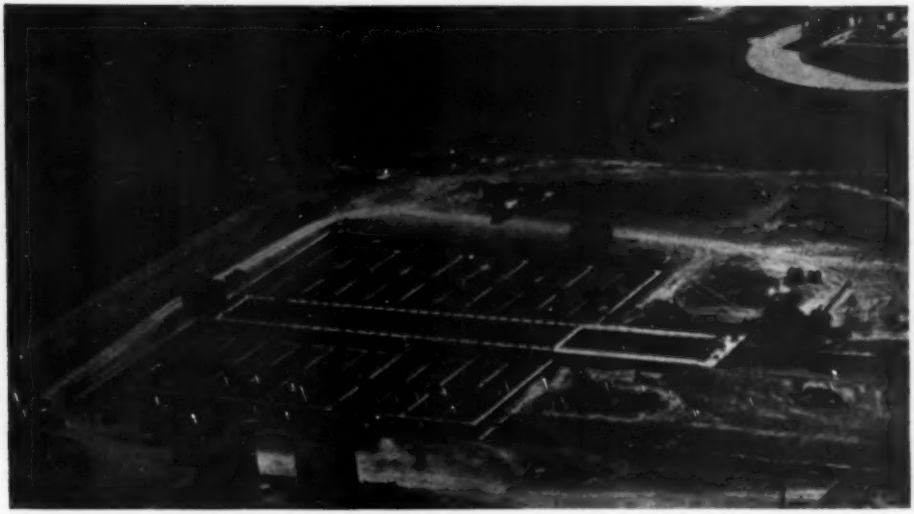
This process actually resembles multiple-effect evaporation rather closely. In both processes steam for heating is obtained from vapors which are at a higher pressure and hence higher saturation temperature than the water being boiled. The principal difference between the two processes is that the pressure differential is obtained by raising the pressure by compression in one case, and by reducing the pressure by creating a vacuum in the other case.

Internal Treatment

In some cases, treatment of boiler feedwater is performed in the boiler itself during normal operation instead of in external equipment. The object of internal treatment is limited to the prevention of adherent scale by causing the precipitation of a dispersed sludge that can be removed by blowing down the boiler. The reagents commonly used for this purpose are sodium carbonate or sodium phosphate. These chemicals cause the calcium to precipitate as carbonate or phosphate rather than as sulfate, which is objectionable because of its inverted solubility. The use of sodium carbonate is limited to pressures below 150 to 250 psi because at higher pressures and temperatures sodium carbonate hydrolyzes to form CO_2 and NaOH. This is objectionable for three reasons; (a) the NaOH may cause embrittlement, (b) the CO_2 is objectionable in condensers because of its corrosiveness, and (c) calcium sulfate scale will still be formed in the boiler. At high pressures, sodium phosphates are used in place of sodium carbonate. Certain organic compounds, such as tannins, may also be added to help disperse the sludges formed, and castor oil may be added to inhibit foaming tendencies of the water. No lime need be added, since bicarbonates are decomposed by the heating in the boiler.



Continuous blowdown systems, with flash tanks and exchangers for heat recovery, are used for removing solids and controlling concentration

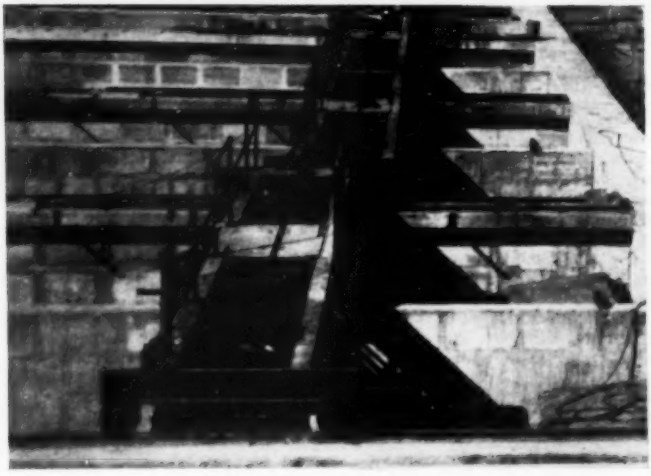


Waste water treatment separator removes oil and suspended solids from 35,000 gpm of process water

TWO OIL COMPANIES FIGHT POLLUTION

Standard Oil of Ohio and Pure Oil Co., having adjacent properties in Toledo, cooperated in designing, installing and operating a joint industrial waste water separator to clean up process water. System contains two sections divided by a distribution chamber

DAVID SKYLAR, *Sanitary Engineering Committee*
National Clay Pipe Association



Close up of the scraper and skimmers that remove sludge from the bottom of the chamber and oil from the surface. Equipment operates entirely automatic

IN Toledo, on the banks of the storied Maumee River, The Standard Oil Co. of Ohio and the Pure Oil Co. have, at a joint cost of a million dollars, installed an industrial waste water separator to remove oil and suspended solids from the 35,000 gal of process water they discharge every minute. The Toledo separator has been in operation long enough to have proved itself effective. In fact it met and surpassed the expectations of technical personnel both at Sohio and the Ohio Department of Health.

To obtain these excellent results, Sohio employed the latest engineering methods and materials. Waste water from the Sohio and Pure Oil refineries is collected in a common culvert and carried by an influent channel to the separator proper. Here it flows through a pair of distribution chambers into 20 separator sections, which operate in parallel. These chambers, totaling nearly one half a mile in length, are specially designed for the separation and removal of oil and solids.

In general, the design followed principles established by the American Petroleum Institute. Although the separator normally handles about 35,000 gpm of process water, it was de-

signed with sufficient capacity to treat an additional 45,000 gpm of storm water to a desirable quality for discharge to the Maumee.

Since the bottoms of the chambers are below the normal water table, ring or collarless vitrified clay pipe was installed. This water head would tend to float the chambers.

In these drains, vitrified pipe is butted together as closely as possible. These consist of 6 in. vitrified plain-ended clay pipe, surrounded on all sides by 2 ft of crushed rock, which in turn is overlaid by sand. The pipe ends are not cemented together. To prevent the entrance of sand the joints are overlaid with a single layer of water-resistant paper or burlap.

Internal glassiness of smooth ring vitrified clay pipe allows a rapid flow of large volumes of seepage and storm water at an extremely low gradient. Half an inch to the hundred feet is enough for 6 in. pipe.

This was fortunate as there was only a 4 ft total head available above the Maumee level. Moreover, the tile is impervious and resistant to freezing, and entirely unaffected by refinery or soil acids or bacteria. It is expected to last indefinitely. In all, 2500 ft of vitrified clay collarless pipe were laid. It is now giving good service.

Another interesting feature at the installation is an oil skimmer and sludge collector heretofore utilized only in connection with sanitary sewage disposal. Oil is skimmed off the top of the water layer in the separator, and sludge is scraped from the bottom of the chamber. The Toledo installation is thought to be the first time this unit has been used in any refinery oil-water separator.

Eleven skimmers are installed, and each spans two separator sections, a total of 10 to the 20 sections. The eleventh unit operates on the distribution chamber for the purpose of skimming oil from the water surface.

As this equipment travels up stream or toward the distribution chamber, the top skimmer remains out of the water. The lower scraper carries sludge along the bottom of the separator basin and moves it into the sludge hopper situated on the floor of the main separator section. When the mechanism reverses itself mechanically by means of a stationary stop, the sludge scraper travels upward and is free from the bottom.

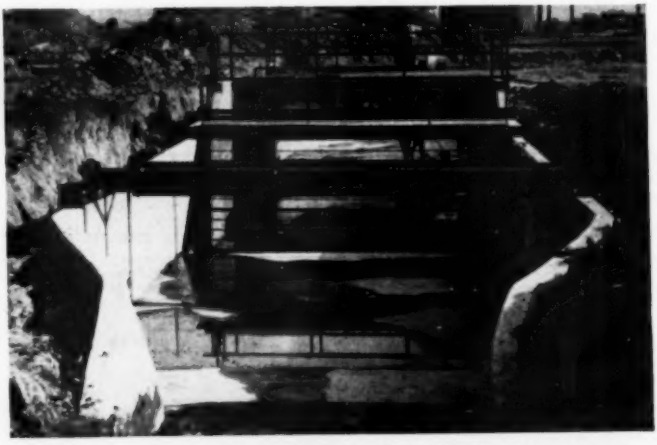
The oil surface skimmer lowers into position to skim oil from the water surface down stream toward the effluent channel. As the unit reaches the oil trough apron, the skimmer pushes the free oil up the apron and into the trough. At the end of this operation, the carriage mechanically reverses itself and returns automatically to start a new cycle. The skimmers were designed for continuous operation, 24 hr per day. However, actual operating experience indicates that intermittent operation may be satisfactory. These units are equipped with a safety device so that if they should jam and stop for any reason, the motor shuts off and an alarm sounds.

This reciprocating type of skimming equipment was chosen over the usual endless type of conveyer for several reasons. Maintenance problems should be less because more bearings ride above the water surface. The skimmer carries the oil in a more positive manner up the skimming apron into the skimmed oil trough, which requires less attention by the operator than does the usual rotating skimmer piping. Finally, initial equipment and installation cost was found to be less.

Since the unit was put into operation, a close watch has been kept, and numerous laboratory tests of the influent and effluent have been conducted. These tests indicate that the operation of the installation is entirely satisfactory, and that it is performing even better than expected in reducing the oil and solids content.

Net result of this installation has been an effluent stream containing 80 to 85 per cent less oil than the effluent from the separator formerly employed.

This distribution chamber divides the two main separator sections. Oil in the chamber is skimmed while sludge flows to separator where it settles



Waste water from the Sohio and Pure Oil refineries is collected in a common culvert and carried by an influent channel to the distribution separator

PRESS BREAKDOWNS ENDED BY SUNTAC

NO MORE MANUFACTURING DELAYS. The manufacturer of these bearings uses heavy-duty presses to blank out parts. The problem of press bearing failures due to inadequate oils has been eliminated by changing to Suntac.

CLEAN FLOOR, CLEAN MACHINE. Adhesiveness prevents Suntac Oil from squeezing out of the bearings. Before Suntac was used, floors had to be cleaned constantly to keep them from becoming slippery and dangerous.

A large ball-bearing manufacturer was having trouble with the oil used in some older heavy-duty presses. At frequent intervals the machinery had to be shut down due to bearings overheating. Because the oil would not *stay in*, bearing life averaged only eight months. Each failure took a press off the line for a month or more. Floors had to be cleaned constantly to keep them from becoming slippery and hazardous. Many different oils were tried in an effort to remedy the situation, but none proved adequate for the job, and production suffered.

Finally the company called in a Sun representative for consultation and changed to a Suntac Oil at his suggestion. Results were excellent, and the presses have operated without a bearing failure ever since. The adhesiveness of Suntac prevents it from squeezing out and keeps the bearings running cool. For the same reason the floors around the presses are free from oil-drip. Oil consumption has been cut 50 percent.

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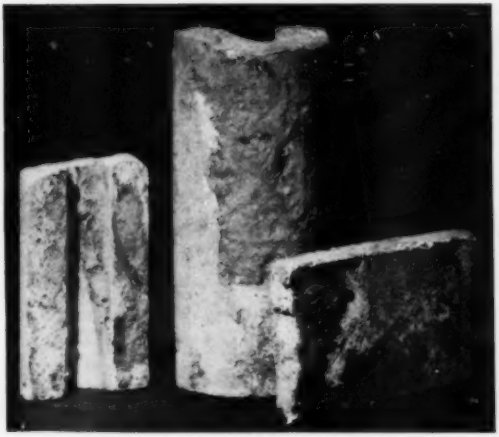
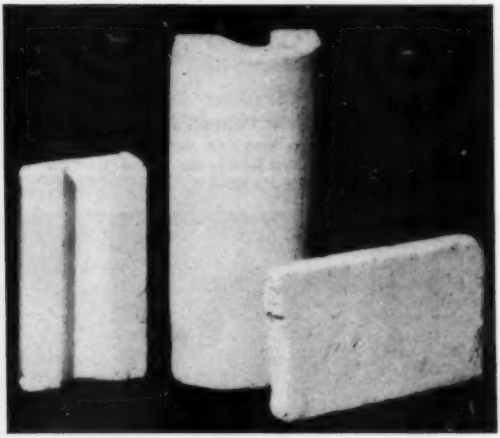




WATER SOAKED AND CAKED WITH MUD, these three pieces of Kaylo Heat Insulation were found partially buried in the Kansas City, Missouri, warehouse of Procter & Gamble after nearly two weeks of Missouri River flood water had receded. The unretouched photograph above shows the wet and mud covered pieces as they looked on arrival at the laboratories in Toledo, Ohio after shipment in a loosely-packed carton.

THE SAME THREE PIECES are shown in this unretouched photograph after they were cleaned by holding them under a water faucet and rubbing by hand, then dried with an electric fan. These pieces are still usable—*proof* of Kaylo Heat Insulation's resistance to water damage. Other Kaylo Heat Insulation, already installed at this plant, was under water during the flood, yet is still in place and performing efficiently.

Kaylo Heat Insulation is a hydrous calcium silicate—the heat-saving material that is revolutionizing insulation practice with its outstanding combination of advantages.

WRITE FOR FREE BOOK—"Kaylo Heat Insulation." Address: Dept. N-311, Owens-Illinois Glass Company, Kaylo Div., Toledo 1, Ohio.

KAYLO® ... *first in calcium silicate*

...*pioneered by* OWENS-ILLINOIS Glass Company

MAIN OFFICE: TOLEDO 1, OHIO—KAYLO SALES OFFICES: ATLANTA • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DETROIT HOUSTON • MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

Handbook for engineered plant services

Methods, data and ideas that make excellent references in solving engineering problems frequently encountered in plant operations

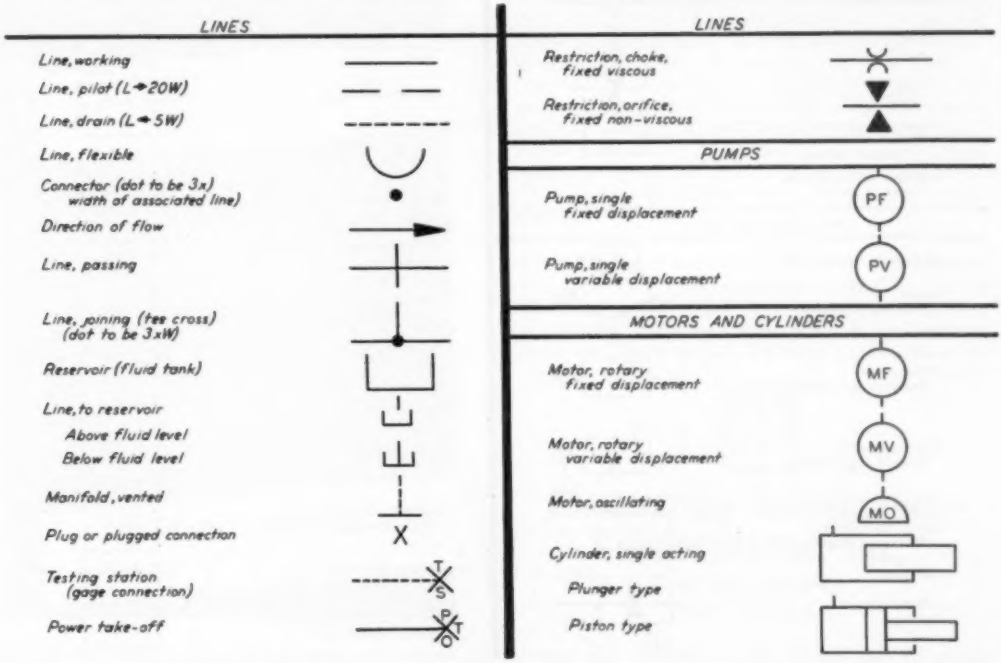
RECOMMENDED HYDRAULIC SYMBOLS

In this issue and the series that will follow will be found a complete list of hydraulic symbols for industrial equipment that has been approved by the Joint Industrial Conference.

Pumps and motors require only identification letters in the body of the symbol. Valves and controls are more complex, but can be easily identified by following the adjacent chart. For example;

Directional control symbols show flow through the valve in normal position. The other two illustrations indicate alternate flow when the spool is shifted. Arrangement is for a 4-way control valve.

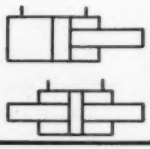
Courtesy of the Denison Engineering Co.



Cylinder, double acting

Single end rod

Double end rod



MISCELLANEOUS UNITS

Motor, drive Electric — ELEC MTR

Heat exchanger — HE

Intensifier — INT

Accumulator — ACC

Filter — FILT

Strainer — STR

Pressure switch — PR SW

Pressure gage

Spring

Shaft, rotating

Component enclosure

VALVE

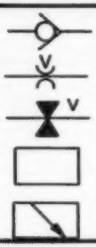
Valve, check

Valve, restriction, choke variable viscous

Valve, restriction, orifice variable non-viscous

Valve, basic symbol (insert model No. for special valves)

Method of indicating internal flow



VALVE EXAMPLES

Valve, manual shut off

Valve, maximum pressure

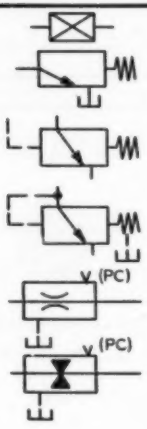
Valve, relief Remotely operated

Valve, sequence Directly operated

Valve, flow control Pressure compensated

Viscous

Non-viscous



Valve, pressure reducing

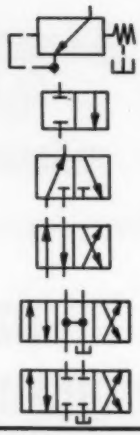
Valve, shut off 2 position – 2 connection

Valve, directional 2 position – 3 connection

Valve, directional 2 position – 4 connection

Valve, directional 3 position – 4 connection open center

Valve, directional 3 position – 4 connection closed center



METHODS OF OPERATION

Control, basic symbol

Control, centrifugal — CENT

Control, compensator — COMP

Control, compensator pressure — PR COMP

Control, compensator temperature — TEMP COMP

Control, cylinder — CYL

Control, detent — DET

Control, manual — MAN

Control, mechanical — MECH

Control, motor electric — ELEC MTR

Control, motor hydraulic — HYD MTR

Control, pilot hydraulic — HYD

Control, pilot air — AIR

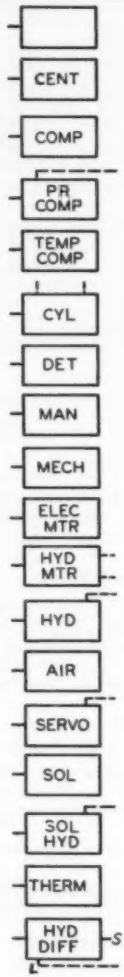
Control, servo — SERVO

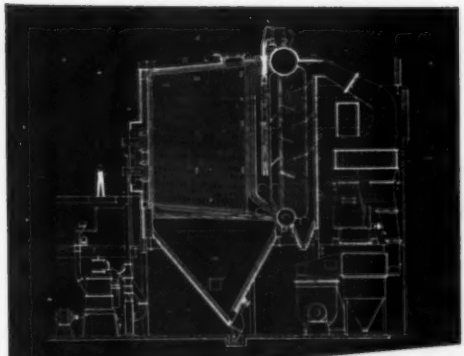
Control, solenoid — SOL

Control, solenoid hydraulic pilot operated — SOL HYD

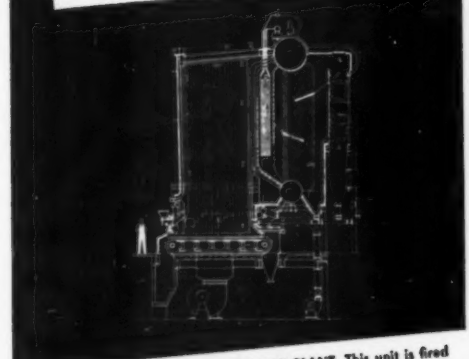
Control, thermal — THERM

Control, pilot hydraulic differential area — HYD DIFF — S

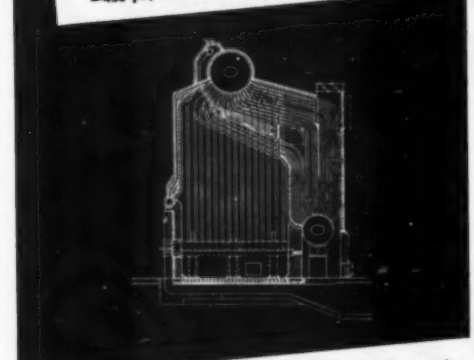




VU installation in a TEXTILE PLANT. This unit is fired with pulverized coal. Capacity—150,000 lb of steam per hour; operating pressure—600 psi; steam temperature—700 F.



VU installation in a TOBACCO PLANT. This unit is fired by a C-E Spreader Stoker (continuous discharge type). Capacity—80,000 lb of steam per hr; operating pressure—425 psi; steam temperature—650 F.



VU installation in an AUTOMOTIVE PLANT. This unit is fired with oil. Capacity—40,000 lb of steam per hour; operating pressure—150 psi.

How different are your steam requirements?

Every engineer knows that steam requirements vary from industry to industry . . . from plant to plant. It is virtually certain, therefore, that your particular conditions of fuel, load, capacity, pressure and temperature are not exactly the same as those of any other plant.

Yet the C-E Vertical-Unit Boiler can deliver top performance in your plant . . . just as it has done in hundreds of others . . . representing a wide variety of steam conditions.

This is because the basic design of the VU allows exceptional latitude in the selection of the *right* boiler to fit your particular requirements. It is available in capacities from 10,000 to 350,000 lb of steam per hr, with pressures from 160 to 1000 psi and temperatures up to 900 F, or more. It is adaptable to limited space conditions and to the use of any fuel or method of firing. The VU may be operated over a wide range of output, and, depending on fuels and the use of heat recovery equipment, efficiencies range up to 88%.

How well is the Vertical-Unit Boiler meeting the steam requirements of different industries? The answer is to be found in an impressive record of orders and repeat orders covering virtually every field. If you would like first hand information on the story of the VU Unit in *your* industry we would be glad to send it to you.

* * *

The point is that the story is the same . . . in industry after industry . . . *the popularity of the C-E Vertical Unit Boiler is widespread and steadily increasing.* Why not investigate how the variables of your requirements can be matched with the VU Unit for top performance?

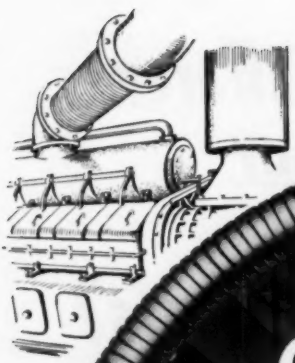
B-540A

C-E

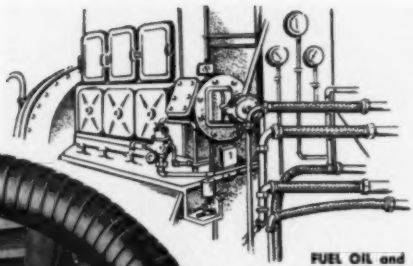
COMBUSTION ENGINEERING—SUPERHEATER, INC.

200 MADISON AVENUE
NEW YORK 16, N. Y.

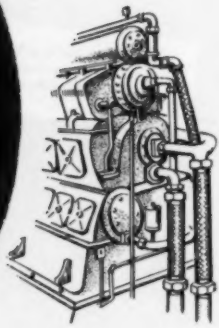
ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS



EXHAUSTS and AIR INTAKES



FUEL OIL and STARTING AIR LINES



LUBRICATING OIL and CIRCULATING WATER LINES

CUSHIONS PULSE OF POWER ...TO MAKE A DIESEL PUR-R-R

PENFLEX FLEXIBLE TUBING DAMPS VIBRATION OUT OF TUG "TITAN'S" DIESEL EXHAUST

As she "revs up" for action, the Nordberg Diesel in the powerful "Titan" just purrs like a kitten. One of the secrets of this big ocean-going tug's smooth, vibration-free power is "flexineering"—the scientific engineering of flexible metallic tubing to the specific requirements of the job.

Running from exhaust to stack is a flexible section of 18" Penflex interlocked metal tubing. As the "Titan" flexes its mighty muscles, Penflex flexes to soak up all vibration. Extra outer jacket provides efficient air cooling. Tubing is safe, tight as pipe — but flexible.

In the diesel power field — on exhausts and air intakes . . . fuel oil and starting lines . . . lubricating oil and circulating water lines . . . or the many other places where tubing is used — you'll find Penflex engineers ready and eager to help you solve your toughest tubing problems. For details on Penflex flexible tubing for all diesel applications, write today for your copy of Bulletin 71.

Pennsylvania Flexible Metallic Tubing Company, Inc., 7238 Powers Lane, Phila. 42, Pa.
Branch Sales Offices: **Boston • New York • Chicago • Houston • Cleveland • Los Angeles**

penflex

HEART OF INDUSTRY'S LIFE LINES

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

Compare it on ANY count

It's DOUBLE safe!

With Type E turbines, you can be doubly sure of protection against overspeed.

A sensitive, powerful centrifugal-weight governor, enclosed in a specially shaped housing, provides extremely accurate speed control.

However, if for any reason the governor loses control, Type E *dual* protection takes over. A corrosion-resistant, spring-restrained weight, mounted in the governor hub, strikes a trip linkage . . . instantly closes the governor valve and an independent steam inlet butterfly valve. Steam is cut off positively . . . danger is avoided.

Dual protection is but one of the many significant features of Type E turbines. We invite your comparison on *any* count. Ask your nearby Westinghouse office for 20-page book B-3896, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-50499-A

Westinghouse
TYPE E
Turbines

Spot news

Short, "boiled-down" paragraphs on the most interesting recent events and developments in American industrial plants

Aluminum Manufacturer Expresses Optimism Concerning Development of New Markets

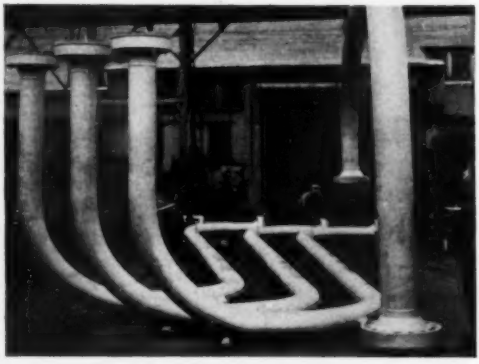
"Aluminum has become a truly basic metal since World War II," D. P. Reynolds, vice president, Reynolds Metals Co., emphasized in a prepared address recently presented. Production figures were cited as basis for this statement. It was pointed out that the aluminum industry is new in its bigness, with this country's primary output jumping from 327 million pounds in 1939 to 819 million pounds in 1946. Since then, production has more than doubled and will almost double again by 1953 when output will be over 3 billion pounds per year. As a result of capacity expansions now in progress the total aluminum supply available to American industry, including scrap and present rate of imports, is estimated to exceed 4 billion pounds a year.

Mr. Reynolds also expressed confidence in the industry's ability to build sufficient markets to absorb this supply. Three factors were cited to make the outlook for aluminum favorable. Raw materials are plentiful. Beside abundance of ore, new sources of power, especially natural gas and lignite, have ended the industry's dependence on hydropower. Atomic power is also a long range prospective source. Another factor is the steady climb of wage rates which has increased cost of material handling and maintenance, thus making the lightweight and rustproof properties of aluminum important. A third factor cited is the industry's policy of keeping prices relatively low and expanding production.

Foreign Power Plant Designed And Built by American Company

Shipment of the first 19 carloads of steel piping for the Bokaro Thermal Power Station, the first high pressure, high temperature steam power plant to be built in India, has been made by the Power Piping Div. of Blaw-Knox Co. Several sections of chrome-molybdenum main steam leads, one 14 in. and three 10 in. diam, are shown being prepared for shipment. Total length of each is over 30 ft. Since India lacks personnel to do the type of welding required, and does not have radiographic equipment for checking welds, field joints have been flanged in the shop.

The new power plant, designed and built by Kuljian Corp., will be operated by Damodar Valley Corp., a government sponsored utility similar in many respects to our TVA. Initially there are to be three 50,000 kw generators with two boilers per generator. Boilers are rated 975 psi and 950 F. Later another 50,000 kw unit will be installed.



Describing the project at a recent conference, E. J. Healy, construction manager for The Kuljian Corp, stated that the "combination of flood control, irrigation, hydroelectric power and steam electric power embodied in this project will realize the new republic of India's hopes for a raised standard of living, and can bring about far-reaching political consequences as an example of America's sincere effort to help other countries to help themselves."

The Cover -- Power on the Potomac

This Potomac Electric Power Co. plant, situated on the beautiful Potomac River in Washington, D. C., generates almost 3 million pounds of steam per hour to supply power for electrical requirements in that locality. Strict attention was paid to the elimination of smoke and fly ash as a means of preventing air pollution. Pulverized coal is used for fuel in this plant. Reprinted with permission from Riley Stoker Co.

Microwave Network Will Provide Communication System for New Pipeline

Texas Eastern Transmission Corp. is constructing a multichannel microwave system to provide radio communication between the company's general offices in Shreveport, La. and all points along its new pipeline to Linden, N. J. The system, consisting of 56 microwave stations with towers varying in height up to 350 ft, is approximately 70 per cent complete and is expected to be placed in operation this summer. Plans for the immediate future, according to the company, include installation of telemetering equipment to provide continuous and instantaneous metering information from any point along the pipeline to dispatching offices and the general office.

(Continued on page 114)

NOW . . . a packaged hot water source that offers compact size and economy

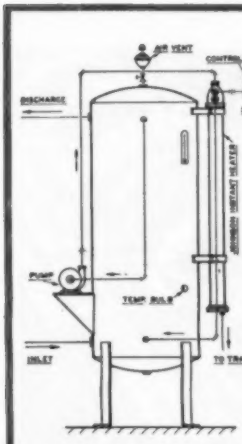
The Johnson SUPER HEATER PACKAGE

Here's the simplest answer yet for most hot water requirements. It is an engineered assembly of storage tank, circulating pump, and the well-known Johnson "Instant" steam water heater. It takes advantage of the idle time between draw-offs to circulate water between tank and heater. Consequently the components can be sized for hourly load, rather than maximum draw-off, with obvious economies.

Forced circulation keeps the entire storage tank at controlled temperature, so that a high percentage of tank volume is available for heavy demands. Storage tank need be only 150% to 200% of maximum draw-off, depending upon time available for recovery. Heater, too, can be proportionately smaller. This arrangement also relieves the boiler of heavy intermittent load demanded for instantaneous service.

Heart of the Super Heater Package is the Johnson "Instant" Heater, long time favorite of operating men everywhere. Its simple design achieves maximum heat transfer in minimum space, and its rugged construction permits hooking it right up to high pressure steam lines.

Get the facts on this remarkable new hot water source. Tell us your hourly demand and steam pressure available and we'll rush full particulars.



Schematic drawing illustrates operation of the Johnson Super Heater Package. Incoming cold water passes through heater to tank. Pump recirculates water continuously, utilizes idle time between draw-offs to build up total volume of tank to set temperature. Forced circulation eliminates stratification, or any need for gravity head. Thermostat controls flow of steam to heater. Note how component parts can be mounted in one complete, self-contained assembly.

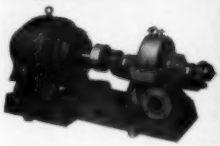
Installation photo shows how the elements of the Johnson Super Heater Package — storage tank, heater and circulating pump — can be adapted to limited floor space and head room. It's a common-sense answer for most hot water requirements — complete, carefully-engineered, compact and economical.

Products of The Johnson Corporation

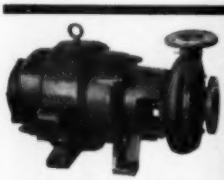
807 Wood St., Three Rivers, Michigan

Rotary Pressure Joints • Compressed Air Separators and Aftercoolers
Direct Operated Solenoid Valves • "Instant" Steam Water Heaters

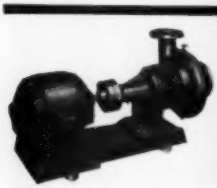
WEINMAN pumps assure uninterrupted service



Two Stage Split Case Pump for high-head service.



General Service Unipump for use where space is limited.



Non-clogging type "U" for liquid carrying solids.

Because plants take their pumping systems for granted a pump break-down most often comes as an expensive surprise.

It's reassuring to have the stamp of approval placed on your plant's pumping system by a WEINMAN Centrifugal Specialist. This man is thoroughly familiar with your requirements. The company that he represents has been a leader in this field since before the turn of the last century. He has earned his title "CAREER MAN IN PUMPS."

It will pay you to invite this man through your plant. His recommendations will help you NOW . . . will help prevent trouble LATER. Just write, wire or phone TODAY.

Representatives in Principal Cities

WEINMAN Pump Mfg. Co

Spot news

(Continued from page 112)

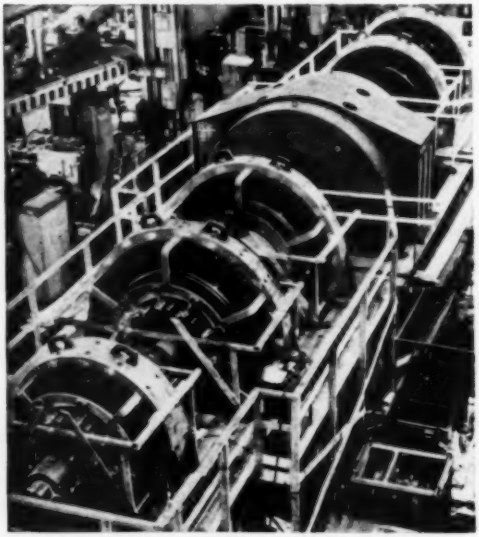
Engineer Cites Gains For Gas Turbine

Much of the world's work tomorrow will be done by the powerful and versatile gas turbine—descendant of the power plant that drives jet airplanes at supersonic speeds. F. T. Hague, aviation and gas turbine consultant for Westinghouse Electric Corp. made this prediction recently at the spring meeting of the American Society of Mechanical Engineers in Seattle.

Harnessed to such jobs as turning generators, driving locomotives and ships, or pumping liquids or gases through big pipelines, the versatile newcomer in the engine field is acquitting itself favorably and promises to assume ever increasing importance. Units ranging in size from a 45 hp machine operating a Navy fire pump to one driving a 15,000 kw electric power generator were described.

"In many types of application, versatility of the basic gas turbine cycle makes it possible to 'tailor make' the engine for the type of job to be done," he said. "Future improvements are more promising for the gas turbine than for any other form of heat engine."

(Continued on page 117)

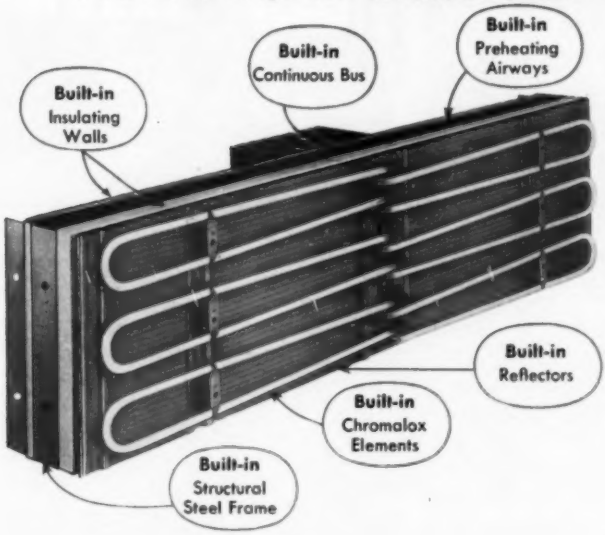


GIANT MOTOR-GENERATOR SET FOR STEEL MILL

Motor-generator set, measuring almost 67 ft over-all and weighing 411,850 lb, is the largest ever built by General Electric. Rated at 10,800 kw and driven by a 15,000 hp synchronous motor, it will supply d-c power for a cold strip mill in the new Fairless Works of U. S. Steel Co. When installed, the unit will have covers for forced ventilation

Announcing

a new and better *INFRARED* Generator



CHROMALOX *Electric* RADIANT PANELS

Now, more efficient *far*-infrared comes in convenient pre-engineered panels, reducing oven building to a matter of determining heat requirements and assembling panels to fit the job.

CHROMALOX Electric Radiant Panels generate more uniformly absorbed *far*-infrared heat with quick heat-up and reduced oven lengths.

It's the *far*-infrared wave length that makes the difference.

- ✓ 9200 Btu's per square foot output per hour.
- ✓ Insulated for voltages to 575 V.
- ✓ Lowest installed cost per kilowatt and per square foot.
- ✓ Work temperatures to 700° F. easily obtained.
- ✓ Accurate "dialed" control.
- ✓ Absolutely uniform radiation—no hot or cold spots.
- ✓ Built to UL and NBFU requirements.

Now. . . Oven Building as Simple as

It's easy to build ovens of any desired height and length with lightweight Chromalox Electric Radiant Panels. Panels come in 1 x 4 ft. and 2 x 4 ft. sizes, ready to erect and connect with easy-to-follow instructions in each carton. Chromalox on-the-spot engineering assistance to help determine your requirements is yours—no obligation, of course.

CHROMALOX *Electric Heat*

Does More - Better - Consistently

Radiant Heating Division EDWIN L. WIEGAND CO.,
7520 THOMAS BLVD., PITTSBURGH 8, PA.

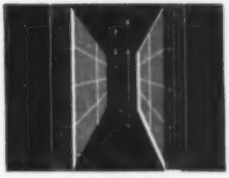
CHROMALOX FAR-INFRARED

For Baking, Drying, Curing, Dehydrating

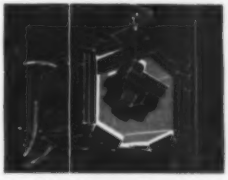
and many other applications.

9 WAYS BETTER

1. **Longer wave length**—absorbed equally fast by all colors.
2. **Shatter-proof construction**—nothing to break and contaminate.
3. **Non-diminishing output** from all-metal Chromalox tubular heat generators.
4. **Uniform heat**—no hot or cold spots.
5. **High intensity radiation**—with more watts per square foot.
6. **Quick heat-up** with energy transformed instantly into heat on the work.
7. **Low-cost oven assembly.**
8. **Infinitely variable output**—from 0 to 100% of capacity.
9. **Additionally safe** for any work involving volatiles.



Easily erected banks of Chromalox Radiant Panels are ideal for line production. Far-infrared heat is radiated directly and uniformly without hot spots over entire work area.



Chromalox Radiant Panels can be erected into any oven shape. Rugged construction permits their use in assembly lines, even when hazards of splashed liquids, volatiles and moisture are present.

Get this Bulletin

It contains complete information, specifications and application ideas for the use of Chromalox Radiant Panels. Write for your copy today.

IC-66

Republic Air Hose makes these rivet guns talk

● And it's a loud voice, too, as nearly 300 rivet guns bark out the signals that mean new railway cars in the making!

The partially fabricated cars simultaneously roll down several production lines, halting only momentarily for the embrace of husky cross hammers that sew up the metal seams with a steady, sure power beat delivered through Republic Air Hose.

As you can see, it's no easy life for a hose!

The floor's concrete and littered with sharp scraps of metal. The constantly flexing hose lies at the workman's feet. Sometimes he stands on it; sometimes he gives it a healthy kick as he jockeys for position over a line of rivets.

But despite the kicks and cuts and bruises and the high pulsating pressures, expected on jobs like these, Republic's Air Hose continues to deliver.

It's so good, in fact, that this particular manufacturer has been using Republic Air Hose since 1929. The hose is bought in long reels and, as required, lengths are cut for use on the giant forming presses, riveters, paint guns, dryers . . . in fact, Republic Air Hose is used on every bit of air-operated equipment in this plant.

And naturally, it's all purchased from a local Republic Distributor, who's always available for immediate deliveries or on-the-spot advice regarding proper selection and care of all types of Industrial Rubber Products.

There's a Republic Distributor near your plant who can give you similar service. Get to know him now!

Simply drop us a card and we'll have him call at your convenience.

Remember, Republic has been **the** specialist in the field for 52 years and—**if it's made of rubber, Republic builds it better!!**

INDUSTRIAL RUBBER PRODUCTS BY
REPUBLIC RUBBER DIVISION
Lee Rubber & Tire Corporation
YOUNGSTOWN, OHIO

Spot news

(Continued from page 114)

Deionization Provides Substantial Savings In Feedwater Treatment at Iowa Utility

Use of a silica-removing deionization system is producing substantial savings in cost of feedwater treatment at the Prairie Creek station of the Central Iowa Power Co-operative, operated by the Iowa Electric Light and Power Co. The two-stage system is meeting severe requirements in conditioning raw water which is high in both ionized solids content and hardness. The system is also performing the important job of removing silica and carbon dioxide.

The deionizing equipment was specified to operate in conjunction with evaporators in preparing makeup feedwater for two boilers operating at 850 psi and 950 F. However, a rapidly increasing power demand necessitated putting the deionizing equipment into service before the evaporators were installed. The plant continued in full operation over three months before a trial run was made on the evaporators. Meanwhile, performance and operation of the deionization system proved satisfactory and the evaporators have not been used.

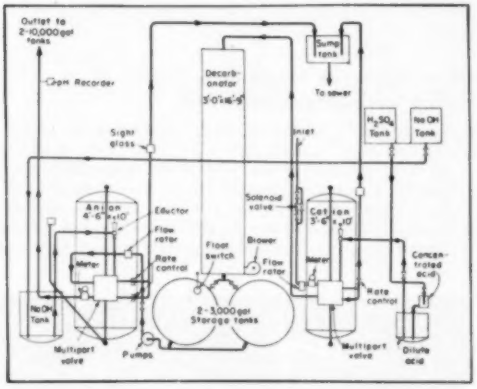


Diagram showing the silica-removing deionization unit of the Central Iowa Power Cooperative
Courtesy of Cochrane Corp.

The raw well water has a total ionized solids content of 414 ppm as calcium carbonate, a hardness of 301.8 ppm (as $CaCO_3$) and a silica concentration of 12.0 ppm (as SiO_2). Treated water averages less than 1.1 ppm in total ionized solids, a quality equivalent to an electrical resistance of approximately 300,000 ohm-cm, with zero hardness and a silica concentration of less than 0.1 ppm. Average cost savings, in comparison with distillation, are approximately 17 per cent.

The installation, which delivers a flow rate of 40 gpm, includes a cation exchange unit, an anion unit, and a single degasifying tower for removal of carbon dioxide. In the anion unit, a bed containing 47 cu ft of Amberlite IRA-400, a

(Continued on page 118)

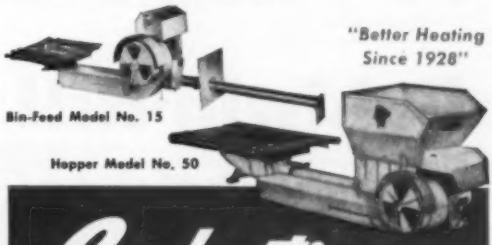
You can do it. If you're still feeding high-priced coal into your boilers and furnaces with expensive hand firing . . . you can save up to 30% on coal and up to 50% on firing time and labor. Your dollars will buy more heat . . . *a lot more!*

Combustioneer Automatic Coal Stokers use much *cheaper* coals, your *first* saving. They use *less* coal, because the patented transmission, and automatic respirator, both originated by **Combustioneer** keep the fire-bed open, porous, free-burning by means of scientific pulsation, get *all* the heat out of the coal.

Hopper and Bin-Feed Models. Combustioneer capacities range from 9 to 1100 lbs. per hour, meeting almost every industrial need. Bin-Feed Models, with a pick-up worm extending up to 16½ ft. under the coal pile, eliminate all hand work in firing. **Combustioneer** Stokers are precision engineered and ruggedly built for extremely long life in hard service.

Get A FREE Heating Survey!

What *does* it cost to heat your plant? How much *could* you save with **Combustioneer** Automatic Coal Stokers? You can have a FREE survey in YOUR plant that will answer those questions. Write and ask for it. We'll send complete **Combustioneer** information too. **Combustioneer DIVISION, THE STEEL PRODUCTS ENGINEERING COMPANY, 1235 W. COLUMBIA ST., SPRINGFIELD, OHIO.**


"Better Heating Since 1928"
Bin-Feed Model No. 15
Hopper Model No. 50
Combustioneer
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STOKERS • COAL-GAS-OIL FURNACES • HUMIDIFIERS

Powerhouse Cement is the star performer in the Baldwin-Hill review of *Black* Rockwool insulating materials . . . a quick-drying, low shrinkage *finishing* cement that insulates. Consider these advantages for a leading role in your next plant improvement picture:

- Effective to 1700°F.
- One coat . . . paints, seals, insulates
- No wire mesh . . . high adhesion to blocks, blankets, or plastic cement
- Linear shrinkage less than 1%
- Finishes *and* insulates . . . figure its thickness as part of the insulation
- Amphibious . . . withstands a drenching rain two hours after application
- Takes oil or water base paint direct

therm-enomics*

PRESENTS

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"the Finishing Cement that Insulates"

Popular Powerhouse is only one of a complete line of B-H *Black* Rockwool insulating materials—block, blanket, cements, etc. Let a Baldwin-Hill representative recommend the types and methods of application best suited to your equipment . . . show you how to reduce heat loss on the job—THERM-ENOMICALLY.*

**Economics of Engineered Heat Control*

Baldwin-Hill

IF IT'S TOO HOT TO TOUCH

IT NEEDS INSULATION

Black Rockwool

8230

clip this coupon and attach to your signed letterhead

SEND ME COMPLETE INFORMATION ON:

- ☐ Mono-Block—for temperatures to 1700°F
- ☐ Blankets—metal reinforced, large-area coverage to 1300°F
- ☐ No. 1 Cement—plastic insulation, to 1800°F
- ☐ Powerhouse Cement—high-adhesion finishing to 1700°F

BALDWIN-HILL CO., 320 BRUNIS AVE., TRENTON, N. J.

Spot news

(Continued from page 117)

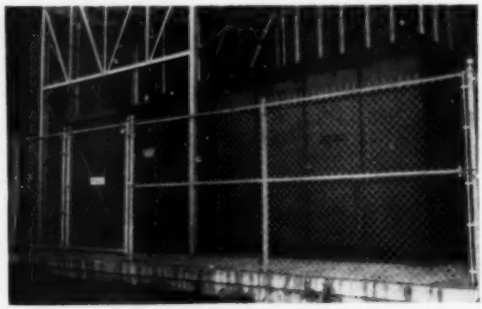
strongly basic synthetic anion exchange resin developed by Rohm & Haas Co., removes not only silica but also any traces of CO_2 missed by the aerator.

About 2.1 lb of caustic per 1000 gal of water treated are required for regeneration of the anion exchanger. For the quality of water employed, this amounts to 0.88 lb of caustic for each kilograin of solids removed, calculated as $CaCO_3$. Between 120,000 and 130,000 gal of water are conditioned between regenerations. Each cation exchange unit, which contains a 51 cu ft charge, is able to condition 21,000 to 23,000 gal between regenerations and requires about 5.2 lb of regenerating acid for each 1000 gal of water treated. For each kilograin of solids removed by the cation exchanger, 0.29 lb of acid are required.

This system has produced treated water of consistently high quality regardless of wide variations in required quantity. Also, week-end shut-downs do not present a problem.

New Substation Installations Result In Big Savings for Cotton Mill

Savings of approximately 25 per cent on motor maintenance and 20 per cent on light bulb replacement are said to have been effected at the Highland Cotton Mill, High Point, N. C. since the installation of five loadcenter substations a year ago. Before the new units were installed, the company had three 750 kva transformers which had become progressively overloaded due to increases in load. Overload



One of the 1500 kva loadcenter unit substations installed at the Highland Cotton Mill

and relatively long cable runs to many motors resulted in low voltage at the motors, causing them to overheat. Attempts to maintain motor voltage by using higher voltage taps on the transformers caused high voltage during light load periods, resulting in excessive lamp burnouts.

To correct the situation and provide for anticipated further increases in load, four 1500 kva and one 750 kva General Electric loadcenter unit substations were installed. The various units were strategically located to obtain minimum cable length. The result has been stable voltage and maintenance savings.

(Continued on page 150)

DETROIT ROTOGRATE STOKERS *Plus* MODERNIZED BOILERS

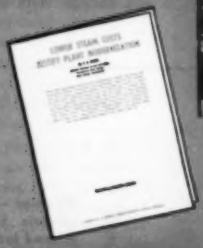
PAY BIG DIVIDENDS at The MICHIGAN PAPER COMPANY of PLAINWELL MICHIGAN

Faced with rising fuel costs and declining efficiency of steam generating equipment, the management of The Michigan Paper Company of Plainwell had to decide whether to repair the present equipment or modernize the boilers and install new stokers.

After thorough investigation by their engineers, it was decided to install Detroit RotoGrate Stokers. The decision was reached on the basis of the RotoGrate's reputation for economical operation with a wide range of fuels, with low maintenance and low power consumption. Since being placed in operation over a year ago, the RotoGrate installation combined with the rehabilitation of the boilers has produced a substantial and satisfactory saving, both in the quantity and the cost of fuel, as well as reducing the cost of operating labor and maintenance.

Detroit RotoGrate is an advanced spreader stoker with grates that move slowly forward to continuously discharge the ash at the front.

The Detroit RotoGrate Stokers at The Michigan Paper Company of Plainwell plant are paying big dividends.



Write for this complete story of the change-over described by T. S. Spicer, Associate Professor of Fuel Technology, Pennsylvania State College in Utilization Magazine. No obligation.

DETROIT SINCE 1898 STOKERS

DETROIT STOKER COMPANY

General Motors Building • Detroit 2, Michigan

District Offices in Principal Cities • Works at Monroe, Mich.

News
of men and companies

AWARDS

Gulf Oil Corp.—R. J. S. Pigott, director of the engineering div of Gulf Research and Development Co., received the Egleston medal for 1952, an award presented yearly by Columbia University's Engineering Alumni Association. The citation accompanying the medal reads: "Distinguished in the application of scientific and engineering principles to a wide range of problems, notably in the design, construction and operation of central steam power stations and industrial plants.

National Electrical Manufacturers' Association—Awarded its fifty-year certificate in recognition of a half century of continuous and outstanding service in the electrical industry to C. E. Johnson, board chairman of Sterling Electric Motors, Inc.

ANNOUNCEMENTS

BullDog Electric Products Co.—Announces price reductions on its complete line of Pushmatic Electri-Center panelboards and Pushmatic circuit breakers.

Brown Boveri Corp.—Has been awarded two contracts for three turbo generator sets, totaling more than $1 million. Alabama Electric Cooperative Inc., Andalusia, Ala., contracted for two 7500/9375 kw steam turbine generator sets intended for installation in the Gantt, Ala., plant of the co-op. Greenwood Mills, Inc., Greenwood, S. C. ordered a 32,500 kw steam turbine with a hydrogen cooled generator.

Chain Belt Co.—Now occupies its new administration building, located at 4701 W. Greenfield, Milwaukee, Wis.

General Electric Co.—More than $2½ million worth of G-E equipment, including drives totaling 14,300 horsepower, is being installed as part of a new five-stand tandem cold-strip steel mill at the Kaiser Steel Corp's Fontana, Calif. plant. The new standard carbide tool fabricating plant of the Carboloy Dept. at Edmore, Mich. will be shown at open house festivities on June 5, 1952. The new Alnico permanent magnet manufacturing plant which will be completed in 1953 will be located adjacent to the Edmore plant.

Iron Fireman Manufacturing Co.—Has purchased the Petro oil burner business. The entire line of Petro oil burners and oil heating equipment will be manufactured in the Iron Fireman Cleveland plant. Headquarters of the Petro oil burner div will be moved to Cleveland, becoming the Petro Div. as of June 1, 1952. J. R. Crews has been appointed sales manager of the div. All present Petro field sales and engineering personnel will continue in the Petro Div., and many members of the Petro operating staff will be transferred from Stamford to Cleveland, it is stated.

Purolator Products, Inc.—Announces formation of a new subsidiary, Transistor Products, Inc., and purchase of a license from Western Electric Co., Inc., to manufacture the pea-size substitute for vacuum tubes. It is reported the company is entering the commercial oil burner fields with fuel, boiler water and air filters using its Micronic principle, and is also completing development of a Micronic filter line for railroad diesel engines.

Reynolds Industries, Inc.—New packaging for Penetrol, a rust preventative, is announced. It is now available in handy and efficient 12 oz aerosol dispensers.

Texas Eastern Transmission Corp.—Has begun initial operations of its new 30 in. pipeline as far north as the Ohio River, and is delivering gas to the Appalachian area through connections with the Columbia Gas System.

Worthington Corp.—The new name and address of the former Dunellen Works is Plainfield Works, Plainfield, N. J.

EXPANSIONS

Allis-Chalmers Manufacturing Co.—Building program costing more than $3 million will start soon at the La Porte, Ind. Works of the Tractor Div. Plans include a manufacturing and storage building containing 210,000 sq ft, and an addition to the boiler house for a fourth boiler of 60,000 lb per hr capacity.

Chatham Electronics Corp.—Announces start of construction on an additional plant located in Livingston, N. J. The building will contain 102,500 sq ft on the main floor with an additional 26,000 sq ft of sub-floor area.

Diamond Alkali Co.—Now plans to construct a perchlorethylene unit at Houston, Texas instead of Painesville, Ohio. Also called a temporary halt to construction on the $12 million expansion project at Painesville so that the program could be re-evaluated in the light of the Houston move.

Electric Regulator Corp.—Signed contract for construction of 15,600 sq

(Continued on page 122)

AEC ESTABLISHES OFFICE OF INDUSTRIAL DEVELOPMENT

The Atomic Energy Commission has established at its Washington hqtrs a new Office of Industrial Development headed by Dr. W. L. Davidson, former director of physical research for B. F. Goodrich Company, to handle the dissemination to industry of AEC technical data of primary importance in the fields of chemistry, metallurgy, specialized equipment and power generation.

The purpose of the new office is to aid in the administration of the industrial participation program—involving studies of power generation—and to expand the areas in which all types of industry may find an interest in the national atomic energy program.

"The office will provide a single point of contact with positive responsibility to foster wider industrial participation in the commission's program and the development, as may be possible, of a more normal competitive approach to the problems and potentials of the atomic energy business," said M. W. Boyer, AEC genl mgr.

"We want to make sure that developments in the national atomic energy commission are promptly made available to the people interested."

Wheeler - Economy officials breaking ground for $600,000 addition to the C. H. Wheeler Mfg. Co. Philadelphia plant. In foreground are (left to right) F. L. Yetter, v-p, L. G. L. Thomas, president, and E. E. Baker, vice-pres

fluor's modern research facilities

test new developments — verify efficiency

At Fluor, the proof of the design is in the testing. *Before* new Cooling Tower developments are incorporated into standard design, they are subjected to rigorous tests in this modern, commercial-size tower testing laboratory. Here, design and performance efficiency of every new development is determined through complete ranges of actual heat transfer conditions. Realistic rating data is established under conditions *paralleling* those of plant and process operations.

Fluor Cooling Tower Testing Facilities. This commercial-size installation consists of a pump house, instrument house, 20,000,000 BTU/H boiler, test basin, and a 40' high test tower.

What this means to you . . .

The motivating power behind Fluor's continuous research and development program is to *always* provide the most efficient cooling tower available. This fact, combined with Fluor's 30 years of active experience in designing major cooling tower installations for the petroleum, chemical, and power industries, means many things to the man seeking a factual tower recommendation to meet his exact cooling requirements.

A Fluor Cooling Tower recommendation means that all variables are included and compensated for. It means that all component parts, as well as all design theory, have been tested and evaluated under actual operating conditions. And, it means that a Fluor-designed cooling tower will perform at *rated* heat transfer efficiency under the conditions of installed operation. *You can be sure with Fluor!*

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For Executives and Engineers Responsible for Engineered Plant Services

KLEMP Metal Gratings

- *Protect against floor wastes*
- *Reinforce all concrete surfaces*
- *Insure fireproof, non-slip footing for men and traffic*
- *Insure efficiency with safety*
- *Insure protection, plus comfort through complete ventilation*

The Klemp Metal Grating Corporation has been serving the needs of those men responsible for the safety of plant employees and the maintenance of all types of flooring for almost half a century. This includes stairways, stair treads, runways, catwalks and tower stairs in industries where there are flooring problems, such as chemical and gas plants, power stations, oil refineries, or where there are turbine rooms and pump rooms. During this time, Klemp has produced and patented several specialized gratings including Hexteel and Floorsteel.

Klemp's engineers have exclusively specialized in the fabrication of gratings such as Hexteel Surface Armor and Floorsteel Flexible Floor Armor for reinforcement of all surfaces where concrete or mastic are applied.

Klemp's diamond riveted and welded gratings are ideal for foot and plant material traffic wherever rugged strength is needed in structural footwalks, stair treads and open steel flooring.

We solicit the opportunity to let Klemp's engineers help solve your most difficult grating problems. Send in your blueprints for quotations today. All types of Klemp Gratings are available for immediate shipment.

KLEMP METAL GRATING CORPORATION

News

of men and companies

(Continued from page 120)

ft plant in Norwalk, Conn. It will be use. L. W. Burn, genl mgr, is supervising planning and development of the plant.

H. K. Ferguson Co.—Has been awarded a contract to engineer and build facilities to convert by-product hydrochloric acid to chlorine at the toxaphene plant in Brunswick, Ga. The unit will consist of a large compressor house, a reactor enclosure, and substantial yard equipment, including drying equipment, condensers, pumps and other auxiliaries.

D. J. Murray Mfg. Co.—Started addition of 37,000 sq ft to the present plant in Wausau, Wisc.

ANNIVERSARIES

Carolina Steel & Iron Co.—"Carolina Steel," an elaborate 76-page commemorative brochure, points up the part this company and its affiliate, Salem Steel Co., have played in the change from an agricultural to an industrial economy in the South.

E. I. duPont de Nemours and Co., Inc.—The company's 150th anniversary will be marked July 18 at the site of the first Du Pont powder mills on the banks of Brandywine Creek a few miles from Wilmington, Del. The story of the company's growth will be told in a book, "Du Pont—The Autobiography of an American Enterprise," to be published about the first of July.

NEW REPRESENTATIVES

BullDog Electric Products Co.—Dissolves its southern div and appoints Walker Electrical Co. of Atlanta, Ga. to handle the southern territory.

Canton Stoker Corp.—Establishes wider district sales and service facilities with the following firms or individuals now announced as additional representatives in their particular areas: H. D. Baker Co., Detroit, Mich.; Tennessee Heating Sales, Knoxville; Russell Smith Equipment Co., Columbus, Ohio; Wm. Knight Associates, Cincinnati; Harry Ropke Associates, Louisville, Ky.; V. C. Snowberger, Indianapolis; F. J. Fallquist Co., Spokane, Wash.; S. C. McCann Company, Kansas City, Mo.; Abgar Heating Co., Buffalo, N. Y.; W. J. Conley Co., New York City; E. C. Sholler, Philadelphia; H. Waring, Greenville, S. C.; Fowler Engineering Co., Milwaukee, Wis.; D. L. Santchi, Toledo, Ohio; F. J. Fuchs, Pittsburgh, Pa.

Conoflow Corp.—Announces appointment of Equipment Sales Corp., 341 W.

(Continued on page 125)

How G.E. washes away lamp troubles with Elgin Ultra-Deionized water

As a development of General Electric's constant research to manufacture better and better fluorescent lamps, a significant finding was the need for absolutely pure water . . . in processes designed to make the best in fluorescent lamps.

To prevent imperfections which could impair efficiency and shorten lamp life, it was found that water must be equal to the best distilled water.

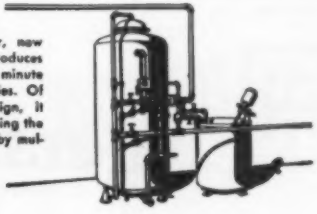
Distilled water might have served, but its cost would be prohibitive. So G-E Lamp Research looked for water of equal quality at justifiable cost . . . and found the answer in Elgin Ultra-Deionized water.

In fact they found a water that for this purpose is *better* than distilled water. Where other high quality waters were not quite good enough, Elgin Ultra-Deionized water met the requirement remarkably well . . . and at a fraction of the cost of distilled water.

So here you have another striking example of a difficult water problem solved by Elgin. The same experience and knowledge that solved it is ready to give you the answer to your problem . . . from simplest to most complex. Write for bulletins or let an Elgin engineer work with you.

ELGIN SOFTENER CORPORATION • 138 N. GROVE AVE., ELGIN, ILL.

ELGIN
SINCE 1908
WATER CONDITIONING FOR EVERY NEED



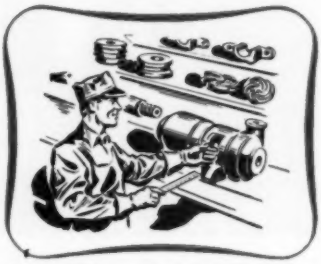
This Elgin Ultra-Deionizer, now used in G-E lamp plants, produces water free from the most minute trace of mineral impurities. Of compact, single-tank design, it produces water far exceeding the quality of that produced by multiple-tank equipment.

Need a pump IN A HURRY?

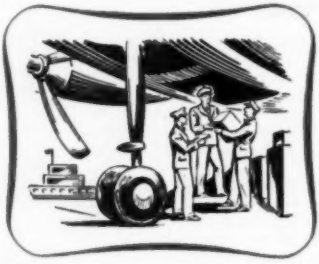
Your mailed order or telephone call to our branch office for a Motorpump can usually be filled immediately from branch warehouse or factory stock.

If by chance, your order requires a special motor or special pump features, our local branch engineers will...

Contact our factory concerning your requirements. These details are immediately reviewed and checked by the factory engineering department and promptly released to the streamlined production department.



Immediately the production line rolls. Your special pump is assembled by skilled workers from large stocks of available parts.



Your completed pump is soon in the hands of the shipping department from where it is sent to you by rail, motor truck or air express. In emergencies, special Motorpumps have been shipped in 24 hours.

Getting *what* you want, *when* you want it, is usually very important to a user of centrifugal pumps. The Ingersoll-Rand MOTORPUMP line is so complete and so flexible, that there is practically no limit to the number of combinations available to meet your precise requirements.

The standard line includes close-coupled pumps (motor or turbine drive), cradle-mounted pumps and condensate return units. Over 200 basic standard units are available with optional features and modifications to meet your special requirements. For further information, telephone, wire or write today for complete details.

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Ingersoll-Rand MOTORPUMP

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A PRODUCT OF INGERSOLL-RAND

COMPRESSORS · AIR TOOLS · ROCK DRILLS · TURBO BLOWERS · CONDENSERS · CENTRIFUGAL PUMPS · OIL & GAS ENGINES

News

of men and companies

(Continued from page 122)

Market St., Kingsport, as representatives serving eastern and central Tennessee as well as southwestern Virginia.

Detroit Stoker Co.—Appointment of The Stephan Co., as district representatives for Cleveland is announced.

The Dampney Co.—M. H. Hilt, Inc., 2531 North Clinton St., Fort Wayne 3, Ind. is appointed sales and service representative.

The Electric Products Co.—Names Robert A. Young & Co., Glendale, as sales and service representatives for southern California and Arizona.

Nordberg Manufacturing Co.—Overvold Distributing, Inc., 13 Fourth St., Moorhead, Minn. is appointed distributor covering North and South Dakota, northwestern Minnesota, northern Nebraska and the eastern counties of Montana and Wyoming.

SALES OFFICES

Hewitt-Robins Inc.—Opens an additional office in the Porter Bldg., 406 W. 34 St., Kansas City, Mo., with R. E. Crane in charge. He will represent three of the four corporate divs: Hewitt-Rubber, Robins Conveyors and Robins Engineers.

Sterling Electric Motors, Inc.—Opens a sales office in Baltimore, Md. with E. S. Farlow in charge. The office is located at 1658 Roundhill Road.

APPOINTMENTS

Owens-Illinois Glass Co.—S. Q. Dittenhoefer is named sales engineer in the Chicago office of the Kaylo Div. He will handle the Chicago and Milwaukee areas.

Wm. Bros Boiler & Mfg. Co.—A. O. Williamson is appointed mgr of the road machinery div. His appointment was announced along with news of the company's organization into three main divs—road machinery, steam power and special fabrication.

BullDog Electric Products Co.—Appoints J. P. Bennett mgr of market research and analysis.

The Electric Products Co.—The board of directors announces election of G. J. Berry as pres.

Flexible Steel Lacing Co.—H. L. Coats, Jr. takes over as the north central states sales representative. H. Beach, who formerly covered this territory, now covers the Pennsylvania-New Jersey area, replacing C. L. Garesche whose recent physical set-backs have caused him to retire.

General Electric Co.—J. F. Farnam, mgr of industrial and contractor sales for the Wire and Cable Dept., is appointed deputy chief of the Wire Mill Branch of the Copper Div of the National Production Authority succeeding J. H. Crawford who died early in March while serving with the NPA.

Industrial Mineral Wool Institute—H. E. Lewis is named executive director.

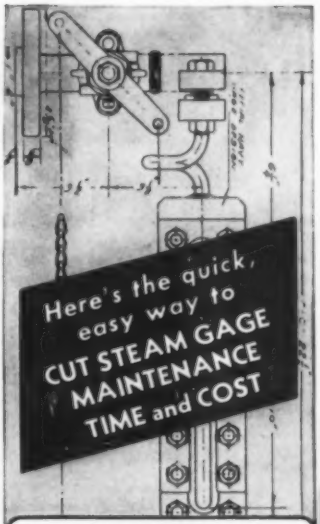
Johnson Service Co.—Newly-elected director is J. S. O'Gorman, Jr., mgr of the Detroit branch, who fills the vacancy left by the late O. G. Ward. New v-p's are J. R. Vernon, P. Gayman and K. A. Wright. Vernon will continue as sales promotion mgr and Gayman will continue as mgr of the western district. Wright, former Cincinnati branch mgr, is now mgr of the central district with hqtrs in Chicago.

Manning, Maxwell & Moors, Inc.—R. C. West and G. F. Bright are assigned to new district mgr positions. West becomes Gulf Coast district mgr with hqtrs in Houston, Tex. while Bright is made mgr of the Mid-Continent district with hqtrs in Tulsa, Okla.

(Continued on page 127)

AUTHOR AWARDED PRIZE FOR *INDUSTRY AND POWER* ARTICLE

C. E. Walker, v-p Drave Corp., (left) presents awards in the company's annual technical paper contest. G. H. Atwood, chief engineer crane and bridge dept, (center) took second prize of $300 for his article in the Oct. '51 issue of INDUSTRY AND POWER. E. P. Swatek won first prize of $500



Install Labor-Saving JERGUSON STEAM GAGE UNITS

. . . with gage and valves furnished as integral unit . . . without gage connection stuffing boxes or end stems.

JERGUSON Steam Gage Units, with gage and valves fabricated as a complete working unit will help you eliminate a lot of your maintenance time and troubles.

Especially designed to cut maintenance time, these complete units have no gage connection stuffing boxes to take care of and no end stems to cut or wire draw.

Gages and valves are an integral unit and have special expansion coils to take care of expansion and contraction. Transparent gage may be rotated to any desired angle; chambers and covers are forged steel; glasses are mica protected against erosion. Available in various models for required visible glass and W.S.P.

Cut your maintenance costs now. Write today for copy of drawing GD-515 and Steam Gage Data Unit.

JERGUSON

Gages and Valves for the Observation of Liquids and Levels

JERGUSON GAGE & VALVE COMPANY

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FASTER, BETTER PRODUCTION WITH NYB&P PRODUCTS

BELTING...

This NYB&P Conveyor Belt, for example, delivered 17,000,000 tons of coal over a period of 21 years without a hitch! Traveling at the rate of 360 feet per minute on a runway nearly 1,000 feet long . . . carrying 500 tons of coal per hour, it gave continuous, trouble-free service from the time it was installed.

HOSE...

Sterling Contractor's Hose has what it takes for both suction and discharge service. There are almost a hundred different hose items in the NYB&P line.

Ten Long Years lifting gravel and sand! That's the remarkable story of this NYB&P Inspiration Elevator Belt, recently replaced by another NYB&P Belt of the same brand!

Every NYB&P product—whether hose, belting or packing—is built to give extra service, more economical operation, increased production. Your local NYB&P Distributor can provide the product from standard stocks, or have one designed for your specific conditions. He will supervise its installation and advise upon its maintenance for maximum efficiency. Get in the habit of consulting him on any problems involving industrial rubber products.

Write for name of Distributor nearest you.

PACKING...

Great Seal Vee Packing is ideal for packing reciprocating rods and plungers against hot or cold water, brine, oil, gasoline, ammonia and hydraulic pressures up to 8000 lbs.

NEW YORK BELTING & PACKING CO. • NYB&P INDUSTRIAL RUBBER PRODUCTS • Since 1846

90% of All Packing Needs Filled By The "LINE OF NINE"

Check over the Line of Nine—the 9 outstanding NYB&P brands that can solve 90% of your normal packing problems. Each is thoroughly reliable, economical, durable. And NYB&P has a complete line to take care of the other 10%.

NEW YORK BELTING & PACKING COMPANY

1 MARKET STREET, PASSAIC, NEW JERSEY

News

of men and companies

(Continued from page 125)

APPOINTMENTS

The Babcock & Wilcox Co.—Appointment of O. R. Carpenter of the Barberton, Ohio works as an executive asst is announced.

A. H. Jackson O. R. Carpenter

Blaw-Knox Co.—A. H. Jackson is named mgr of the tower dept succeeding E. J. Staubitz, who has retired, but will continue to serve in a consulting capacity.

The Korfund Co., Inc.—D. H. Vance, formerly executive engineer and asst genl mgr, is elected v-p.

Minneapolis-Honeywell Regulator Co.—O. B. Wilson is made field sales mgr for the Industrial Div. succeeding W. H. Steinkamp who was recently made genl sales mgr of the div.

The Okonite Co.—Announces that E. D. Youmans, v-p in charge of manufacturing and research, was elected to the company's board of directors.

Pennsylvania Crusher Co.—E. H. Keiper is made chief engineer of this subsidiary of the Bath Iron Works Corp.

Raybestos-Manhattan, Inc.—Announces appointment of H. H. Burrows as sales mgr of the industrial rubber goods sales div and C. P. McHugh as mgr of the roll covering and tank lining production depts.

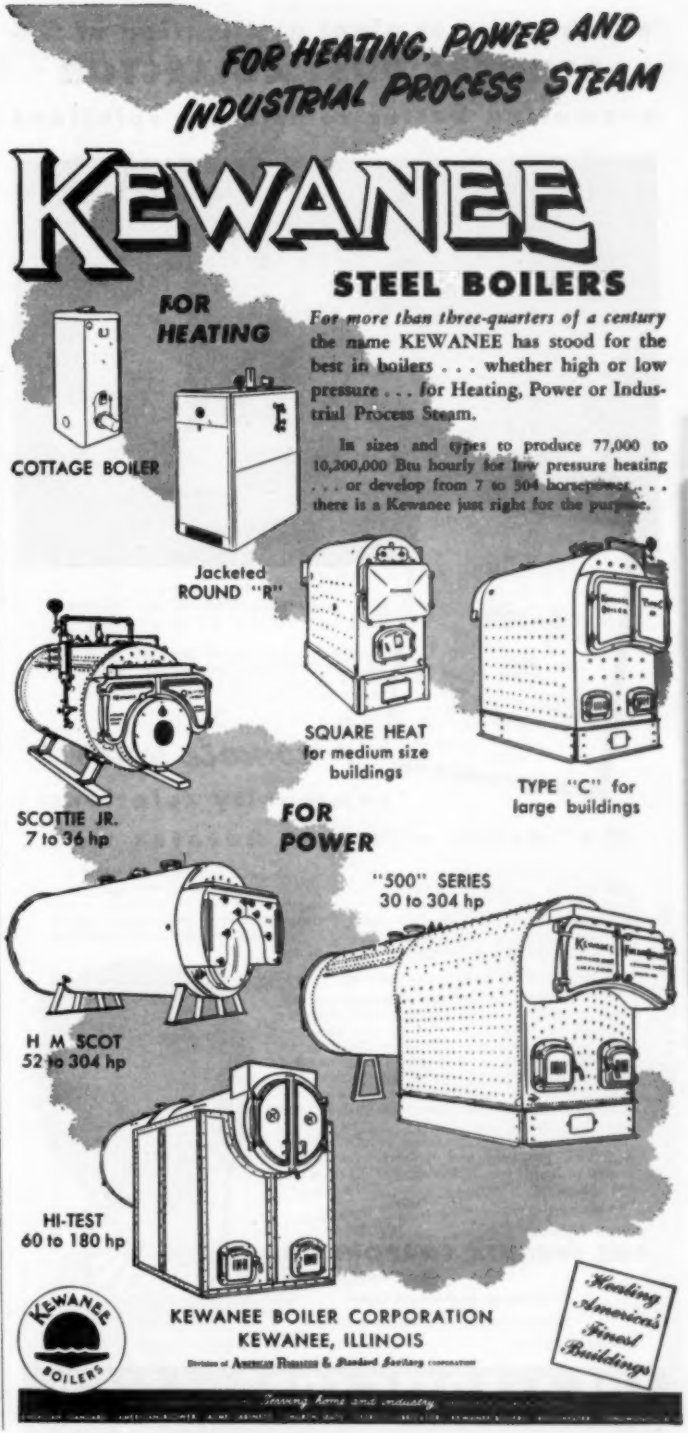
The Timken Roller Bearing Co.—Appointment of J. F. Byron as sales engineer, Railway Div. at the Minneapolis, Minn. office is announced.

Union Carbide and Carbon Corp.—M. G. Dial is elected pres succeeding F. H. Haggerson, who continues as chairman of the board. W. E. Remmers is named v-p of the Alloys Div.

Universal Atlas Cement Co.—Appointment of F. P. Diener as director of tests and research for this U. S. Steel subsidiary is announced. He succeeds G. L. Lindsay, deceased.

Westinghouse Electric Corp.—W. W. Sproul becomes v-p in charge of the

(Continued on page 128)


FOR HEATING, POWER AND INDUSTRIAL PROCESS STEAM
KEWANEE
STEEL BOILERS
FOR HEATING
COTTAGE BOILER
For more than three-quarters of a century the name KEWANEE has stood for the best in boilers . . . whether high or low pressure . . . for Heating, Power or Industrial Process Steam.
In sizes and types to produce 77,000 to 10,200,000 Btu hourly for low pressure heating . . . or develop from 7 to 304 horsepower . . . there is a Kewanee just right for the purpose.
Jacketed ROUND "R"
SQUARE HEAT for medium size buildings
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SCOTTIE JR. 7 to 36 hp
FOR POWER
"500" SERIES 30 to 304 hp
H M SCOT 52 to 304 hp
HI-TEST 60 to 180 hp
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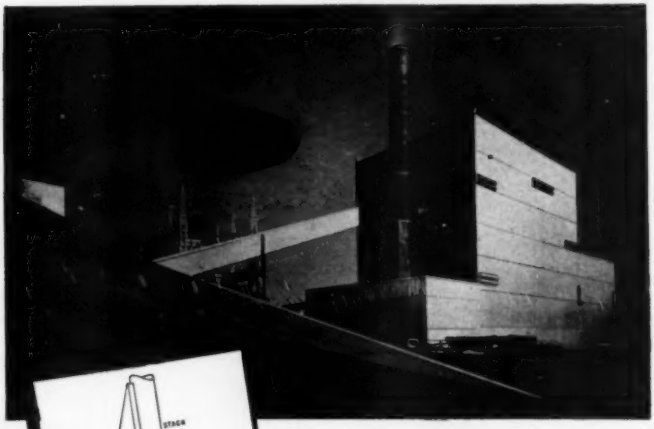
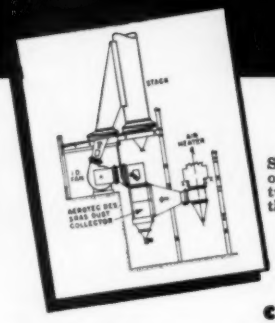
Division of American Radiator & Standard Sanitary Corporation
KEWANEE BOILERS
Heating America's Finest Buildings
Serving home and industry

another power plant application of the
AEROTEC DUST COLLECTOR
promoting better community relations





Riverton Station
Northern Virginia Power Company

Sectional drawing shows location of AEROTEC Dust Collector between air heater and I.D. fan at this Riverton Station.

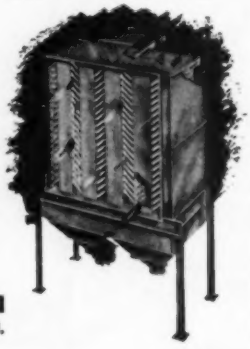
Promote your community relations
the highly efficient Aerotec way

A clean stack has proven time and again to pay valuable dividends in community good will. To gain this advantage, plus plant erection and maintenance economies, public utilities are specifying the Aerotec Design 3 RAS Dust Collector. This unit develops a higher centrifugal force through the use of multiple, small-diameter tubes, resulting in exceptionally high efficiencies on ultra-fine dusts.

Flexible and space-saving

The tubes are permanent mold aluminum and closely nested to provide lighter weight and more capacity per square foot of plan area than any collector of comparable efficiency. They are set at a 45° angle on vertical tube sheets, factory-assembled into lightweight "building block" sections that reduce installation time and permit the Aerotec Design 3 RAS to be easily tailored to fit available space.

Our field engineers specialize in solving flyash collection problems and welcome the opportunity to assist you at any time. Call or write. No obligation.



Project Engineers
THE THERMIX CORPORATION
GREENWICH, CONN.
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Montreal 25, Quebec Toronto 3, Ontario

THE AEROTEC CORPORATION
GREENWICH, CONN.

News
of men and companies

(Continued from page 127)

APPOINTMENTS

genl industrial products group of divs, which comprise the Micarta, Standard Control, Small Motor, Elevator, Sturtevant, Welding, and Lighting Divs, and The Bryant Electric Co. L. B. McCully is elected in charge of the East Pittsburgh Divs. H. E. Seim is named v-p in charge of the Sturtevant Div., with hqtrs in Boston, Mass., and also The Bryant Electric Co., a wholly-owned subsidiary in Bridgeport, Conn.

Worthington Corp.—W. D. Johnson is named western regional supvr of the sale of welding positioners and industrial mixers. He will make his hqtrs in the San Francisco office.

Canton Stoker Corp.—J. F. Stenglein is named sales mgr with J. C. Fosselman asst sales mgr.

J. C. Fosselman J. F. Stenglein

Allis-Chalmers Mfg. Co.—A. E. Dorn succeeds R. M. Stone as industrial sales mgr. T. F. Finley and G. N. Lester are named asst engineers, the former in the switchgear section, and the latter at Boston Works. H. M. Snapp is now asst engineer in the steam turbine section. A. L. Morningstar is promoted to asst application engineer in the control section.

National Association of Fan Manufacturers, Inc.—At the thirty-fifth annual meeting the following officers were elected: R. A. Wasson, president; J. M. Frank, v-p; and L. O. Monroe, secy-treas. Wasson is v-p and genl mgr of the Clarage Fan Co., while Frank is president of the Ilg Electric Ventilating Co.

Link-Belt Co.—W. L. Hartley is transferred to executive sales hqtrs at Chicago to specialize in the application of long-haulage belt conveyers and to assist on other major engineering projects.

Ahlberg Bearing Co.—E. J. Klimczak is appointed chief engineer, secy of the company and member of the board of directors.

General Electric Co.—Construction Materials Dept. products will be handled by R. M. Bonk in the southeastern district.

The International Nickel Co., Inc.—R. Cooper, Jr. is appointed mgr of the nickel sales dept and H. D. Tietz mgr of the Inco nickel alloys dept.

Sylvania Electric Products, Inc.—New asst to the pres is S. B. Williams, formerly director of public relations. Succeeding Williams is G. W. Griffin, Jr., formerly mgr of G. E. Co.'s news bureau.

Linde Air Products Co.—T. D. Cartledge is appointed president of this division of Union Carbide and Carbon Corp.

Gai-Tronics Corp.—A. R. Royle is promoted to genl mgr and elected to the board of directors.

H. T. Sulcer A. R. Royle

Graver Water Conditioning Co.—H. T. Sulcer, genl mgr, is elected a v-p of the parent Graver Tank & Mfg. Co., Inc., East Chicago, Ind.

ANNOUNCEMENTS

The Babcock & Wilcox Co.—Opened new hqtrs in the Chrysler Bldg East at 161 East 42nd St., New York. Sales offices of the tubular products div will remain at 22 East 40th St.

L. J. Wing Mfg. Co.—Recently held "Open House" at which company service awards were presented. Feature was presentation of 50 year award to company pres H. S. Wheller.

Quaker Rubber Corp.—New stock carrying branch warehouse and sales office is established at 260 Schuyler Ave., Kearney, N. J.

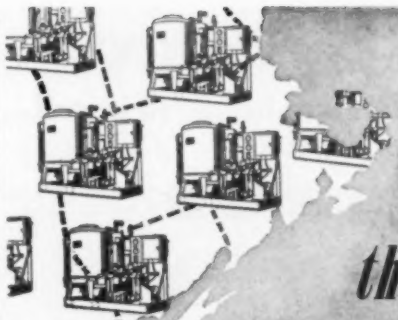
Texsteam Corp.—This div of Vapor Heating Corp. now handles sales of Texsteam safety valves, chemical injection pumps, Vapor-Clarkson steam generators and other products.

Quaker Rubber Corp.—Expansion of its rubber roll covering facilities at a cost of $100,000 is completed.

Warren Steam Pump Co.—S. C. May now represents Warren and Warren-Quimby pumps in Atlanta territory. His hqtrs will be at 585 Sherwood Road, N. E.

Minneapolis-Honeywell Regulator Co.—J. A. Robinson is named sales mgr of the eastern and mid-atlantic regions for the Industrial Div. J. J. Matulis succeeds Robinson as mgr for the midwest.

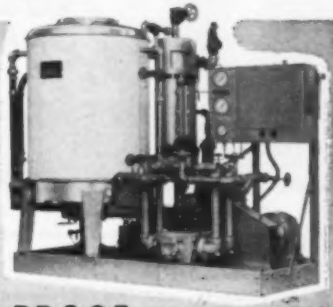
(Continued on page 130)



In *thrifty* NEW ENGLAND...

THERE ARE MORE *Clayton* FORCED RECIRCULATION STEAM GENERATORS IN USE THAN *ALL OTHER PACKAGE TYPE BOILERS COMBINED

* Self contained steam generators of from 15 to 100 horsepower



for the reason and proof of this statement mail the coupon

THIS COUPON BRINGS **PROOF** TO YOUR DESK

An animated, colored flow chart shows you how and why the Clayton Forced Recirculation principle can cut your steam costs.

IP-6

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Box 550, EL MONTE, CALIFORNIA
Send name of nearest distributor and arrange desk demonstration of Clayton Forced Recirculation principle. Send catalog.

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ADDRESS_____ STATE_____
CITY_____

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MANUFACTURING COMPANY
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NOTED FOR *Efficiency*...

This simple mechanism is *Easy* to install... *Easy* to service

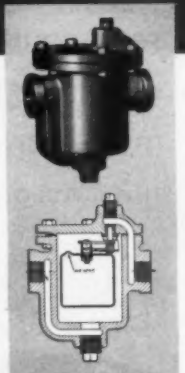
HOFFMAN Bucket Traps operate intermittently and are particularly applicable to draining condensate and air from steam lines or equipment where large quantities of air and condensate must be discharged. They are easily inspected, cleaned and serviced by merely removing the cover assembly.

Straight-through pipe connections permit close-to-floor installation.

All working parts are connected to the bonnet and are removable with it for service without breaking pipe connections.

These are features of design appreciated by the maintenance man in saving man-hours when man-power is costly and scarce.

Hoffman Bucket Traps are adjustable to a wide choice of pressures, simply by changing valve seats. Send today for full information, no obligation.



SERIES 600A TRAP
Pressure Range 0 to 125 lbs. Capacity From 600 to 1150 lbs. Condensate Per Hour

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Makers of Valves, Traps, Vacuum and Condensation Pumps, Forced Hot Water Heating Systems.
Sold by leading wholesalers of Heating and Plumbing Equipment.

News

of men and companies

(Continued from page 129)

APPOINTMENTS

Hall Laboratories, Inc.—H. M. Rivers is promoted to director of engineering service succeeding J. N. Welsh, who as associate director recently assumed new business administration duties.

W. G. Slife H. M. Rivers

Nordberg Manufacturing Co.—Appoints W. G. Slife sales engineer in the Dallas, Texas office of the Heavy Machinery Div.

Chiksan Co.—R. T. Jones, formerly sales engineer in New York, is appointed field engineer with hqtrs at the main plant in Brea, Calif.

Worthington Corp.—Announces appointment of J. P. McArthur as mgr of the Phila district sales office, succeeding the late W. J. Daly. H. W. King succeeds McArthur as regional mgr, west coast sales. P. L. McManus is named mgr of the San Francisco district office.

Johns-Manville Corp.—W. P. Gibbons is promoted to advertising mgr, industrial products. He succeeds H. T. Bain who resigned because of health.

The Airetool Mfg. Co.—P. B. Soderberg, formerly associated with L. Fintel, mgr of the Chicago sales office, is named

J. W. Kueker P. B. Soderberg

mgr of the New Jersey office, replacing E. K. Ingalls, deceased. J. W. Kueker is appointed to fill the post vacated by Soderberg in the Chicago sales office.

Nordberg Manufacturing Co.—Transfer of T. J. Angel, sales engineer from Milwaukee to the St. Louis, Mo. office is announced.

The American Pulley Co.—C. E. Bain, Jr., joins the organization as mgr of manufacturing and will report to J. H. Robins, pres.

New York Belting and Packing Co.—Appoints A. G. Colgin sales representative in the east Texas and Mississippi oil fields. His hqtrs will be in Shreveport, La.

Enterprise Engine & Machinery Co.—S. F. Atsatt is added to the sales engineering staff. D. J. O'Leary becomes sales engineer with offices in San Francisco.

American Wheelabrator & Equipment Corp.—Personnel shifts and staff additions in the dust and fume control div are announced as follows: W. S. Schamel to asst technical director. G. W. Roper, J. K. Davidson, and F. A. Lindahl named project engineers. Engineers added to the staff as project engineers are: W. G. Carrie, W. H. Williamson, and F. R. Culhane.

The Cleveland Chain & Mfg. Co.—H. C. Brainard is appointed chief metallurgist.

Edward Valves, Inc.—New mgr of sales promotion and advertising is J. E. Foley, Jr.

OBITUARIES

C. C. Rausch, asst v-p and mgr of NO-OX-ID Rust Preventive Sales, Dearborn Chemical Co., died April 29, in Houston, Tex.

E. J. Hamilton, 68, sales mgr of Ware Fuse Corp. died May 12, after a brief illness.

K. L. Fitzpatrick, mgr of public relations and advertising of The Dayton Power and Light Co. died May 15. He was 66 years of age.

C. D. Slaughter, asst genl sales mgr of Anaconda Wire & Cable Co., died in April at his home in New York City, at the age of 67, after a short illness.

E. W. Tait, mgr of the fabricated products dept of Combustion Engineering-Superheater, Inc., died in April at the age of 65.

E. D. Power, 56, board chairman, Lyon Metal Products Inc., died suddenly at his home on April 13.

W. B. Phillips, pres of Pyrene Manufacturing Co. died in April at Roosevelt Hospital, New York City. His age was 66.

E. Plagwit, 76, head of the Chimney Div. of The Rust Engineering Co., died in a fall from the eighth floor of an apartment bldg during the excitement of a 6-alarm fire.

F. E. Guy, retired genl traffic mgr, Universal Atlas Cement, died suddenly April 14 of a heart attack at the Pittsburgh Traffic Club.

F. C. Richardson, mechanical engineer with Westcott & Manes, Inc., died April 5 at the age of 65.

—End

Single or double fan installations with automatic controls. Double operates on single furnace, or serves two. On single furnace either fan can operate up to 70 percent capacity; other fan then cuts in automatically.

TYPE 1 TYPE 1A TYPE 2 TYPE 2A TYPE 3

You eliminate fluctuations or losses in draft efficiency by the use of Prat-Daniel Stacks. P-D Fan Stacks coordinate the relationship of fans, breeching and stacks to provide and maintain maximum efficiency.

Thousands of P-D Fan Stacks in long operation have proved their superior reliability over induced-draft fans and stacks purchased separately. Easily applied to any installation, they provide highly efficient draft for the load conditions of your power plant.

Our project engineers provide expert assistance on any problems of draft production and control. Call them on current problems or planned installations. Write for Catalog No. 200.

UNIT RESPONSIBILITY

Prat-Daniel, through its sales and project engineers, The Thermix Corp., offer a complete complement for handling the air gas stream shown at left; 1. Forced Draft Fans, 2. Air Pre-heaters, 3. Tubular Dust Collectors, 4. Induced Draft Fans and 5. Fan Stacks. This unit responsibility, by a well-known firm, relieves the engineer of the responsibility for one of the most important functions in a steam generating plant.

Sales and Project Engineers

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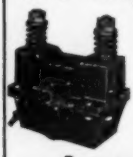
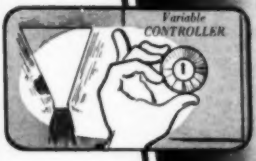
SOUTH NORWALK, CONN.

SYNTRON
"Pulsating Magnet"
Electric Vibrators
The Way to Assure
Free-Flowing
Hoppers,
Bins and
Chutes



Bins clogged? Don't pound, rod and poke them . . . Apply Syntron Electric Vibrators Just turn the dial . . . and watch the material flow.



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Recent books, published for men responsible for the Engineered Plant Services, are reviewed here. Write to the publisher for those in which you are interested

Exhaust Hoods

"Exhaust Hoods" by J. M. Dalla Valle, Professor of Chemical Engineering, Georgia Institute of Technology. Published by The Industrial Press, 148 Lafayette Street, New York 13, N. Y. 141 pages with 127 illustrations, drawings and tables. Price $3.50.

The book is a primary source of data, based on the author's own experimental investigations on the flow of air around and into the openings in exhaust ventilating systems. A concise treatment of fundamental theory (including the latest thinking along the lines of what is known as the "dilution concept") and of practical applications of theory to the actual design of hoods, booths, and slot designs for all types of industrial installations. Four chapters are devoted to various aspects of theory, including flow of gases, velocity characteristics of canopy hoods, and standards for determining hood effectiveness. Other chapters cover actual hood design, booth-like structures, grille openings, woodworking machinery, examples of hood design calculations, entrance losses, and the essentials of good construction. There are also sample problems with the solutions worked out in detail.

Heat Transference

"Industrial Heat Transfer" by F. W. Hutchinson, Professor of Mechanical Engineering, University of California. Published by The Industrial Press, 148 Lafayette Street, New York 13, N. Y. 315 pages, including 123 working charts. Price $6.00.

A combined text and reference work that provides a selective, rather than a comprehensive coverage of the heat transmission field. It offers a time-saving approach to the methods of heat transfer analysis. The graphs give a wide range of industrial applications equal in accuracy to the equations from which they are constructed thus permitting direct visual solution without need of computation.

Industrial engineers will be particularly interested in the section covering forced convection of gases or liquids, whether heating or cooling while flowing within or outside of pipes. Analytical solutions for these cases would require the determination of viscosity, specific heat, thermal conductivity, and density, all as functions of temperature. However, the wide variety of charts provide a simple method of solution by direct evaluation, without requiring determination of any physical properties of heat transfer characteristics of a particular fluid. The graphs permit the user to quickly extract the information that was built into them, over a period of hours. The page opposite each graph gives the equation, its limitations, extension and a reference to its discussion in the text.

Meetings and exhibitions

Announcement of coming meetings that will aid executives and engineers in planning itineraries. For additional information, please write sponsors of meetings

JUNE

Air Pollution & Smoke Conference of America will be held at the Statler Hotel, Cleveland, Ohio, June 9-12. Write R. T. Griebling, exec secy, APSPAA, Mellon Institute, Pittsbugh, Pa.

American Society of Mechanical Engineers holds its semi-annual meeting at the Sheraton-Gibson Hotel, Cincinnati, Ohio, June 15-19. For further information write O. B. Schier, meetings manager, ASME, 29 W. 39th St., New York 18, N. Y.

American Society of Mechanical Engineers holds it 24th Annual Conference and Exhibit of the Oil and Gas Power Div. at the Statler Hotel, Buffalo, N. Y., June 23-27. Write O. B. Schier, meetings manager, ASME, 29 W. 39th St., New York 18, N. Y.

American Institute of Electrical Engineers, summer meeting, to be held at the Nicollet Hotel, Minneapolis, Minn., June 23-27. Details from H. H. Henline, secy, AIEE, 33 W 39th St., New York 18, N. Y.

SEPTEMBER

Centennial of Engineering. Convocation period, comprising general meetings to be held in Chicago, has been scheduled for Sept. 3-13. For information write: 57th St. & South Shore Drive, Chicago 37, Ill.

Instrument Society of America holds the National Instrument Conference and Exhibit in Cleveland, Sept. 8-12. For exhibit information contact Richard Rimbach, exhibit manager, ISA, 921 Ridge Ave., Pittsburgh 12, Pa.

National Electronics Conference will hold its 8th annual conference at the Sherman Hotel, Chicago, Ill., Sept. 29, 30 and Oct. 1. Details from S. R. Collis, chairman, NEC, 208 W. Washington St., Chicago, Ill.

Announcing

THIS SALT-SPLITTER SYSTEM removes both alkalinity and hardness by means of two resin beds in one tank. Needing only inexpensive salt — no acid — for regeneration, it offers these advantages:

1. Permits operation at alkalinities approaching zero, since no acid is present to damage equipment or produce acid water.
2. Eliminates costly rubber- and lead-lined tanks and piping.
3. Simplifies disposal of spent regenerant.
4. Provides complete safety for operating personnel.

Users of sodium zeolite softeners who find them unsuitable because of the high alkalinity of the effluent or who may be by-passing raw water for boiler make-up should definitely investigate the possibilities of incorporating this system into present installations.

For a concise explanation of the operation of this new combination of two proven water-conditioning methods, get a copy of the new Allis-Chalmers bulletin, 28X7808. Just fill in and mail the coupon.

Allis-Chalmers
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Please send Bulletin 28X7808 describing alkalinity reduction by ion exchange.

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ALLIS-CHALMERS AC

Water Conditioning

✓EQUIPMENT ✓CHEMICALS ✓SERVICE

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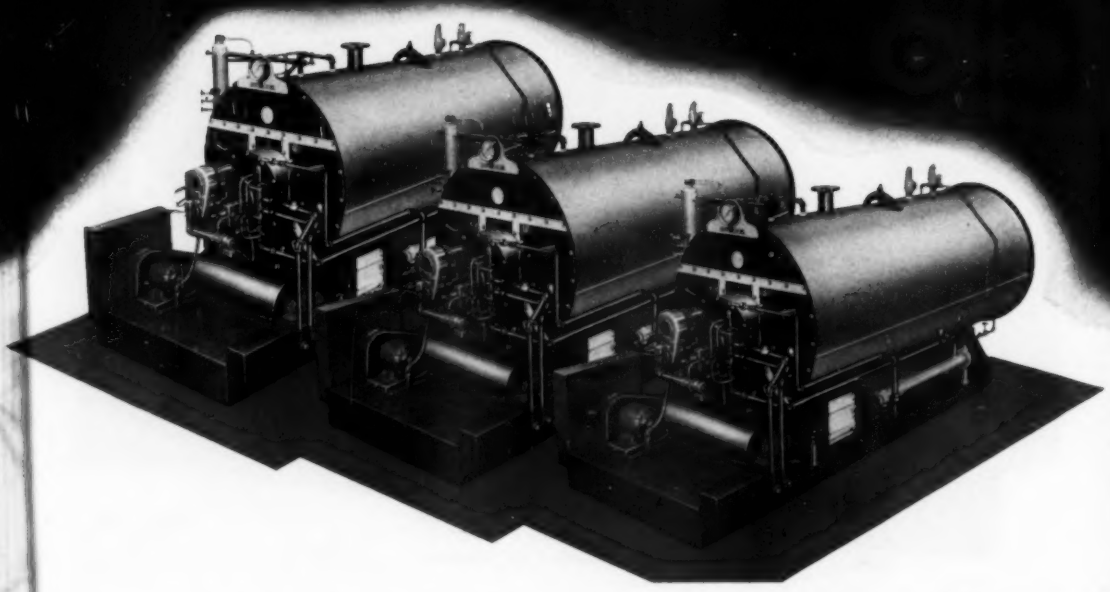
WHEN YOU'RE COUNTING

Superior STEAM GENERATORS



Battery installations of Superior Steam Generators provide extreme flexibility to meet the most widely fluctuating steam demands. A hospital installation illustrates the point.

From early June through September, steam demand is limited to the needs of hot water and sterilization. Any one of the three units carries this load with ease . . . and at higher efficiency than could be obtained by minimum operation of a larger boiler.

When cold weather adds its heating load, a second Superior Steam Generator is fired. Only the most severe weather demands firing the third unit . . . which throughout the rest of the year provides stand-by equipment which is desirable in any operation.

By employing different combinations of the three, (7 in all) allowing each unit in turn to share the load; all enjoy longer life at maximum efficiency . . . and by using only the number dictated by the steam demand, maximum economy at every stage of steam demand is assured.

Let us show you how battery installation can serve you better in your new plant . . . or augment your present steam facilities.

Write today for Catalog 402

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Begins on page 8

Contains highlights of new products by leading manufacturers, briefed and illustrated for your easy reference. Complete data on each of these products are available **free.**

2. NEW BULLETINS

Begins on page 152

Includes descriptions of only those bulletins and catalogs that are really **new** and of **direct value** to you — saves your reading time, yet gives you full service. All bulletins sent to you **free** on request.

3. READERS GUIDE TO ADVERTISED PRODUCTS

Begins on page 137

Designed to catalog advertised products for your convenience in finding the ads which are of special interest to you at this time. Also lists those important bulletins, catalogs and working data offered **free** in the advertisements.

REQUEST CARD FOR LITERATURE OR MORE INFORMATION—June, 1952

To: INDUSTRY AND POWER, St. Joseph, Mich. Please have forwarded to me, at no obligation, the literature I've indicated by the following key numbers:

New Equipment begins Page 8	*New Bulletins begins Page 152*	*Advertised Products begins Page 137*
No's	No's	No's

Your Name _____ Title _____

Your Company _____

Co. Address (St. & No.) _____

City _____ State _____

Inquiries for items listed in this issue not serviced beyond October 1, 1952

FIRST CLASS
PERMIT No. 19
(Sec. 34.9, P.L.&R.)
ST. JOSEPH, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

3¢—POSTAGE WILL BE PAID BY

INDUSTRY AND POWER

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ST. JOSEPH, MICH.

3 *special departments featured monthly to give you FREE bulletins, catalogs and product data screened for your personal interest in*

ENGINEERED PLANT SERVICES

1. NEW EQUIPMENT

Begins on page 8

Contains highlights of new products by leading manufacturers, briefed and illustrated for your easy reference. Complete data on each of these products are available ***free.***

2. NEW BULLETINS

Begins on page 152

Includes descriptions of only those bulletins and catalogs that are really ***new*** and of ***direct value*** to you — saves your reading time, yet gives you full service. All bulletins sent to you ***free*** on request.

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Readers' guide to advertised products

This department is both a product index for advertising and a keyed listing for advertised literature. Refer to advertisement on page indicated and contact advertiser directly—or list paragraph key numbers on reader service card (page 135) to get data you want

AIR & DUST FILTERS & COLLECTORS

Dust Collectors
Adv. page 128 contains information on Aerotec design 3 RAS dust collector. The Thermix Corp.

Dust Collection **500**
"LR" bulletin contains data on the new Buell "LR" dust collector. Buell Engineering Co. p 165.

ANTI-CORROSIVE & PROTECTIVE COATINGS

Lined Piping
Adv. p 3 contains data on Plioweld lined pipes, fittings and equipment. Goodyear Tire & Rubber Co.

Rust Preventive **501**
Page 55 contains coupon for information on Rust-Oleum sealing compound. Rust Oleum Corp.

BOILERS & BOILER ACCESSORIES

Boilers **502**
Descriptive literature available on Wickes boilers. The Wickes Boiler Co. p 177.

Boilers
Adv. p 127 contains information on Kewanee steel boilers. Kewanee Boiler Corp.

Vertical Unit Boilers
See adv. p 109 for information on C-E vertical unit boilers. Combustion Engineering-Superheater, Inc.

Steam Generator
Adv. p 63 gives information on Union "H" type steam generator. Union Iron Works.

Steam Generating Units
Adv. p 30, 31 contain information on Riley steam generating units. Riley Stoker Corp.

BUILDING HEATING, VENTILATING, AIR CONDITIONING & REFRIGERATION

Unit Heaters
Adv. p 68 contains information on Trane unit heaters and diffusers. The Trane Co.

Temperature Control
See adv. p 22, 23 for information on automatic temperature and humidity control for heating, ventilating, air conditioning and process control. The Powers Regulator Co.

BUILDING MATERIALS & MAINTENANCE

Pipe Joint Compound **504**
Free sample of Key-Tite water-proof sealing compound. Key Co. p 162.

Iron Cement **505**
Free Repair Handbook describes Smooth-On repairs. Smooth-On Mfg. Co. p 175.

Heavy-Duty Cleaners **506**
Complete details on G-E heavy-duty cleaning equipment. General Electric Co. p 158.

Steel Grating **507**
Bull 2365 contains information on electro-forged steel grating. Blaw-Knox Div., Blaw-Knox Co. p 174.

Metal Gratings
See adv. p 122 for metal grating for all types of floors. Klemp Metal Grating Corp.

COAL, ASH & BULK HANDLING

Conveyer Belting **508**
Free booklet "Production-eering for Industry" contains data on belting, hose, packing & molded rubber products. Quaker Rubber Corp., Div. of H. K. Porter Co., Inc. p 65.

Conveyer Belting
See adv. p. 126 for information on NYB&P belting, hose and packing. New York Belting & Packing Co.

Electric Vibrators **509**
Illustrated catalog folder available on electric vibrators. Syntron Co. p 132.

COMPRESSORS

Rotary Compressors **510**
Bull C-5 gives complete information on Fuller rotary compressors. Fuller Co. p 62.

Motor-Driven Compressors **511**
Bull 118 contains data on Clark balanced-opposed, motor-driven air compressors. Clark Bros. Co., Inc. p 4.

Industrial Air Compressors **512**
New literature GC-52 describes Schramm's small industrial air compressors. Schramm, Inc. p 158.

Compressors
Adv. p 9 contains information on motor and turbine driven compressors. The Cooper-Bessemer Corp.

CONTROLS, REGULATORS & INSTRUMENTS

Tank Gage **513**
Details available on Liquidometer tank gage. The Liquidometer Corp. p 170.

Regulators **514**
Bull 350 contains information on Spence pressure and temperature regulators. Spence Engineering Co., Inc. p 44.

(Continued on page 138)

PRODUCT INDEX

Air & Dust Filters & Collectors 137
Anti-Corrosive & Protective Coatings 137
Boilers & Boiler Accessories 137
Building Heating, Ventilating, Air Conditioning & Refrigeration 137
Building Materials & Maintenance 137
Coal, Ash & Bulk Handling 137
Compressors 137
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Electrical Distribution 138
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Fuels & Firing Equipment 140
Heat Exchanger Equipment 140
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Mechanical Power Transmission 142
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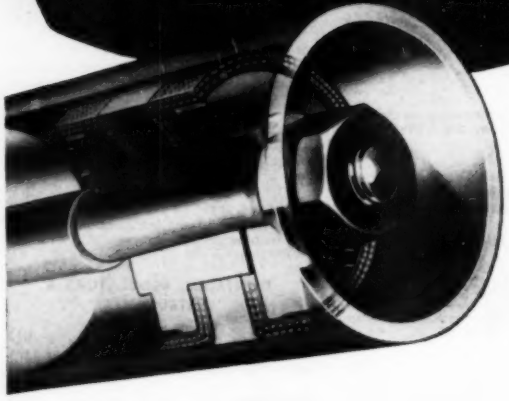
Packing & Gaskets 144
Pipe & Fittings 144
Pumps 145
Refractory Concretes 145
Soot Blowers & Tube Cleaners 145
Steam Specialties 145
Thermal Insulation 146
Tools 146
Turbines 147
Valves 147
Water Treatment 147

YOU GET

higher efficiency

WITH DARCOVA PUMCUPS

ON THE JOB!



THERE are two basic, well-proved reasons why more and more Darcova Pumcups are going into cylinders of air and hydraulic controls and mechanisms.

First, texture-engineered Pumcups outlast most other piston packings at least 3 to 1. There's less replacement, less down-time!

Secondly, efficiency *does not diminish* as Pumcups wear. Response is always faster, surer, with less power consumed!

Darcova Pumcups are available in sizes and engineered textures ideal for virtually any service. Why not find out what they can save *you?*

ASK FOR BULLETIN No. 4502

DARLING VALVE & MANUFACTURING CO.

Williamsport 9, Pa.

DARCOVA

THE ORIGINAL COMPOSITION CUP

PUMCUPS

Readers' guide to advertised products

(Continued from page 137)

Regulators **515**
Bull 50-1000 contains data on Stacon regulator. Farris Stacon Corp. p 170.

All Metal Thermometers **516**
Literature available on Weston all-metal thermometers. Weston Electrical Instrument Corp. p 157.

Gages **517**
Copy of drawing GD-515 and Steam Gage data. Jerguson Gage & Valve Co. p 125.

Feed Water Meters **518**
Details available on Henszey feedwater meters. Henszey Co. p 164.

ELECTRICAL DISTRIBUTION

Switchgear **519**
Cat Sec 7004 and Bull 7000-A contain complete data on I-T-E metal-clad switchgear. I-T-E Circuit Breaker Co. p 26, 27.

Electrical Conduit **520**
Bull C-201 fully describes Sealtite flexible electrical conduit. The American Brass Co., American Metal Hose Branch. p 69.

ELECTRICAL HEATING UNITS

Radiant Panels **521**
Bulletin contains complete data on Chromalox radiant panels. Radiant Heating Div., Edwin L. Wiegand Co. p 115.

ENGINES

Engines
See p 50 for information on modern diesels, dual fuel, or high compression gas engines. Worthington Corp., Engine Div.

Engines
See adv. p 155 for data on CP engines for straight diesel, dual fuel, or gas operation. Chicago Pneumatic Tool Co.

FANS & BLOWERS

Industrial Fans **522**
Cat 400 gives data and specifications on fans and blowers for every industrial and commercial application. Chelsea Fan & Blower Co., Inc. p 162.

Fans **523**
Cat 200 gives information on Prat-Daniel fan stacks. The Thermix Corp. p 131.

Blowers **524**
Coupon in adv. p 29 offers data on blowers and exhausters. Coppus Engineering Corp.

Fans and Blowers
Adv. p 2 contains coupon for more information on Hartzell fans and blowers. Hartzell Propeller Fan Co.

FILTERS, STRAINERS & PURIFIERS

Twin Strainers **526**
Bull A-13 contains data on twin strainers redesigned for better performance and lower operating cost. Elliott Co., Accessories Dept. p 161.

(Continued on page 140)

Big Esso bulk plant relies on Marlow Pumps to CARRY THE LOAD!

. . . and what a load! 10 million gallons of gasoline a month can be put through this New York City District bulk station . . . one of the world's largest and most modern. The pumping system is fully automatic — with thirteen big, dependable and thrifty Marlow Self-Priming Centrifugal Pumps at the heart of it.

From underground storage this battery of 4-inch Marlows delivers gasoline to one section of the loading rack. Pumps, operated by remote control from the control tower, can load a 1900-gallon truck in 5 minutes. It's a fast, efficient and virtually maintenance-free installation . . . and it takes good pumps to do the job. It takes Marlows.

Through 1800 feet of piping another battery of pumps — these Marlow 6-inch high-pressure models — serves the loading rack which has automatic pressure and velocity control of pump. As with the others, the pumping, though intermittent, is always smooth — thanks to the Marlows' ability to prime and reprime automatically. They won't vapor lock either — and they operate quietly and economically because of their exclusive free-flow design.

More and more petroleum marketers, from the largest majors to smallest independents, choose Marlows for their plants and trucks. MARLOW PUMPS DO MORE AND DO IT BETTER, THAT'S WHY!

Marlow is the manufacturer of the world's largest line of petroleum marketing pumps. Your problems will get expert attention from the Marlow engineers. Let them help you. Write without obligation.

USE THIS COUPON

MARLOW PUMPS
609 GREENWOOD AVENUE
RIDGEWOOD, N. J.

☐ Please send me helpful literature
☐ Please have a representative call

Name .....
Company .....
Street .....
City ..... State .....

MARLOW PUMPS

GREENWOOD AVENUE RIDGEWOOD, N. J.

HEWITT-ROBINS

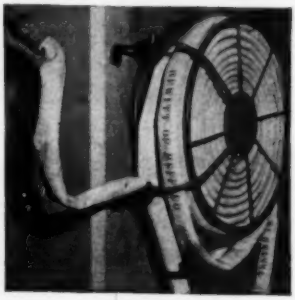
FOR FASTER, SAFER WELDING

Use Hewitt-Robins Twin-Weld— 2 Hoses Molded on 1 Line

Speeds Welding: In patented Twin-Weld®, both a green oxygen and red acetylene line are molded in one compact, flexible, easy-to-handle unit. Ideal for use in close-quarter work.

Stops Tangling: Eliminates dangerous tangle of two separate hoses—won't kink—makes welding jobs safer.

Get The Whole Story: Call your Hewitt Rubber Distributor (see classified phone book) or write for Bulletin H-4.



FIRST FOR FIGHTING FIRES

Hewitt-Robins Fire Hose— Unexcelled For Over 80 Years

For the finest fire hose money can buy, always specify Hewitt-Robins Maltese Cross®, Monarch® (Underwriters specification) . . . or Ajax® Mill (General Service). They are unequalled for service, quality and safety.

Whatever your requirements for fire hose, you will find that Hewitt-Robins has the right hose to meet your needs . . . cotton-jacketed—rubber-covered chemical booster . . . each one is *first* in its class.

For complete fire hose facts: Call your Hewitt-Robins Distributor (see "Rubber Products" in classified phone book), or write for Bulletin H-2.

HEWITT-ROBINS HR **INCORPORATED**

STAMFORD CONNECTICUT

Hewitt Rubber Division
Hewitt Rustfoam® Division
Robins Conveyors Division
Robins Engineers Division

Readers' guide to advertised products

(Continued from page 138)

Strainers **525**
Bull 1226 contains information on Sarco scraper strainers. Sarco Co. p 175.

FUELS & FIRING EQUIPMENT

Stokers **527**
Data and free survey available on automatic stokers. Combustioneer Div., The Steel Products Engineering Co. p 117.

Fuel Oil Units **528**
Bull OB-37 contains complete details on Enco fuel oil pumping and heating units. The Engineer Co. p 141.

RotoGrate Stokers **529**
Complete story of change-over described in adv. p 119 available. Detroit Stoker Co.

HOW TO REQUEST FREE LITERATURE

Insert "key" numbers on return post card found on page 135. For quick reference to free literature offered by advertisers in this issue, refer to listing on page 148. Our Reader's Service Department will handle your request promptly

Coal
Adv. p 146 contains information on this product. General Coal Co.

Coal
See adv. p 47 for information on Beacon Coal. Eastern Gas & Fuel Assoc.

Burners **530**
Bull CBM contains data on the John Zink Series CBM combination gas and oil burner. John Zink Co. p 37.

Coal
See adv. p 12, 13 for information on bituminous coal. Bituminous Coal Institute.

HEAT EXCHANGER EQUIPMENT

Film Type Exchangers **531**
Bull HE-7 describes typical installations of Vogt film type exchangers. Henry Vogt Machine Co. p 64.

Instantaneous Water Heaters **532**
Engineering data available on instantaneous water heaters. Pick Mfg. Co. p 176.

Packaged Hot Water **533**
Facts available on engineered assembly of storage tank, circulating pump, and steam water heater. Johnson Corp. p 113.

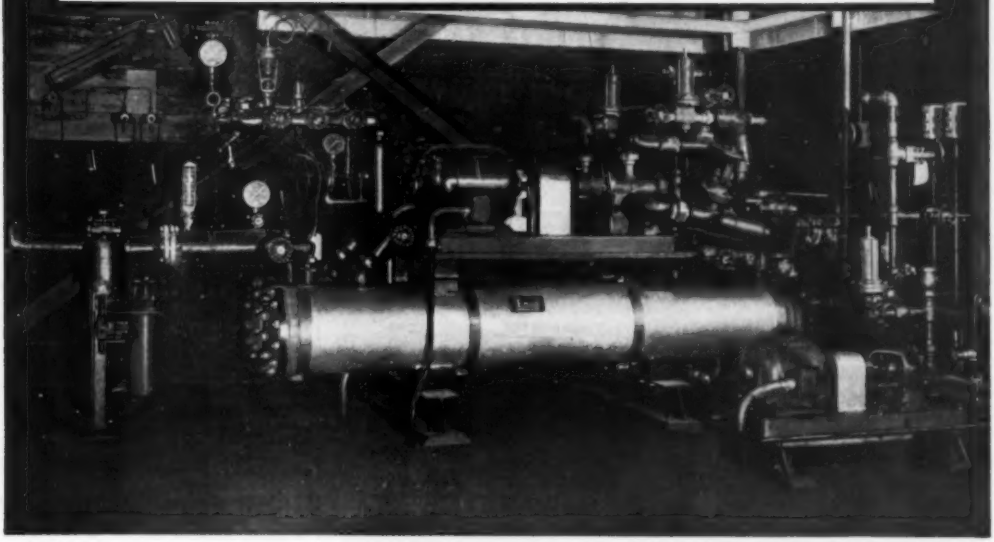
Cooling Towers **534**
Information on Fluor cooling tower testing facilities. The Fluor Corp. p 121.

INSTRUMENTS FOR MEASURE OF ELECTRICITY

Testing Instruments
Adv. p 43 contains data on G-E line of testing instruments. General Electric Co.

(Continued on page 142)

2 separate ENCO Fuel Oil Units Meet Plant Needs



Here is a typical Enco two-unit installation which handles fuel oil pumping and heating requirements in the plant of a building materials manufacturer.

Fuel Oil Pumping and Heating Unit, built with two pumps and two heaters, is designed for continuous plant load service. Capacity is 11 gpm Bunker C fuel oil with one pump or one heater at 300 psig pressure with a temperature rise from 90F to 230F.

Light Oil Pumping Unit for cold start-up service. Capacity is 3 gpm #2 oil at 300 psig pressure.

Enco pump sets are designed to give you easier control and longer maintenance-free operation. They are simple and economical to install. All you need do is to connect to station piping and run. Before shipping, every Enco Fuel Oil Pumping and Heating Unit is completely tested under high pressures. For complete details on wide-range line, write for Bulletin O B-37.

Only ENCO offers all ten plus features

1. Completely Automatic Operation is assured by automatic temperature and pressure regulation valves.

2. Coordinated Design Saves Space. All equipment essential to the preparation of fuel oil for combustion is contained in one compact unit.

3. Individually Designed to meet the specific needs of the particular power plant in accordance with its exact operating requirements.

4. All Parts Visible and Accessible for easy operation, maintenance and repair.

5. Pumps and Heaters are interconnected to provide maximum flexibility of operation.

6. Safety Valves protect individual parts where required.

7. Easier Maintenance — Less Service-Time for Cleaning because straight tube, multi-pass heaters with removable heads are used.

8. Pumps Operate at Moderate Speed. Heaters designed to give the correct viscosity and velocity without fouling.

9. Smoother Flow of Clean Fuel to Furnace. Air chamber for each piston pump prevents pulsations—pressure regulator for rotary pumps. Twin type strainers provided to keep atomizer tips from clogging.

10. Cleaner Boiler Room . . . all overflows connected to a common outlet, flanged drip pan catches oil drip.

EC 488

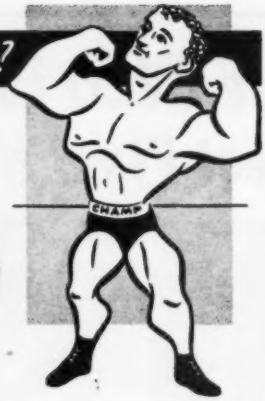
THE ENGINEER COMPANY

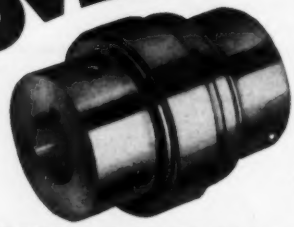
75 WEST STREET, NEW YORK 6, N. Y.

IN CANADA: F. J. RASKIN, LTD., 4220 IBERVILLE ST., MONTREAL 34, P. Q.

Want the strong, silent type?

LOVEJOY





FLEXIBLE COUPLINGS

Dependable Lovejoy Flexible Couplings absorb shock, noise, vibration, starting torque and intermittent overloads—protect both motor and driven machinery—increase bearing life. New multiple leaf spring holds collar in place — allows 50% higher speeds with full safety. No shutdowns for changing cushions . . . no lubrication ever needed . . . cushions for every duty - 1/6 to 2500 H.P.

Write for catalog and quick - finding selector charts.

LOVEJOY FLEXIBLE COUPLING CO.

5043 W. LAKE ST. CHICAGO 44, Ill.

Also mfrs. Lovejoy Universal Joints and Lovejoy Variable Speed Transmissions.

NON-FLUID OIL

TRADE MARK REGISTERED

Recommended For The Highest Speed Portable Electric Tools

NON-FLUID OIL has the "stayability" necessary for the constant dependable lubrication needed for gears and bearings operated at the high speeds of portable electric tools. NON-FLUID OIL keeps tools in steady service and does not separate under elevated temperatures and centrifugal force—thus holds down maintenance costs.

Write for free testing sample of NON-FLUID OIL stating the make and model of the portable tool in which it will be used.

NEW YORK & NEW JERSEY LUBRICANT COMPANY

292 Madison Avenue, New York 17, N. Y.

Works: Newark, N. J.

WAREHOUSES: Atlanta, Ga. - Birmingham, Ala. - Charlotte, N. C. - Chicago, Ill. Columbus, Ga. - Detroit, Mich. - Greensboro, N. C. - Greenville, S. C. - Providence, R. I. - St. Louis, Mo. Also represented in most other industrial centers including Cleveland, Ohio - Cincinnati, Ohio - Pittsburgh, Pa. - Syracuse, N. Y.

NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our manufacture.

Readers' guide to advertised products

(Continued from page 140)

LUBRICANTS, LUBRICATION, OIL FILTERS & PURIFIERS

Oil Filters
Adv. p 162 contains data on Winslow oil filters. Winslow Engineering Co.

Industrial Oil
Adv. p 45 gives information on Stanoil industrial oil. Standard Oil Co.

Oil Purifiers **535**
Literature describes complete line of Hilco purifiers, filters, reclaimers and conditioners. The Hilliard Corp. p 168.

HOW TO REQUEST FREE LITERATURE

Insert "key" numbers on return post card found on page 135. For quick reference to free literature offered by advertisers in this issue, refer to listing on page 148. Our Reader's Service Department will handle your request promptly

Diesel Lubrication
Adv. p 20, 21 contain data on Gascon oil for diesel lubrication. Sinclair Refining Co.

Colloidal Graphite **536**
Bull No. 426-17F gives data on "dag" colloidal graphite for all metal-working operations. Acheson Colloids Co. p 61.

Lubricant
See coupon in adv. p 105 for information offered on Suntac oil. Sun Oil Co.

Oils & Greases **537**
Recommendation charts for industrial applications. Adam Cook's Sons. p 148.

Non-Fluid Oil **538**
Free testing sample of Non-Fluid Oil for pneumatic tools. New York & New Jersey Lubricant Co. p 143.

MATERIALS OF CONSTRUCTION

Nickel Alloy **539**
Technical Bull T-5, "Engineering Properties of Monel and 'R' Monel." The International Nickel Co., Inc. p 60.

MOTORS & GENERATORS

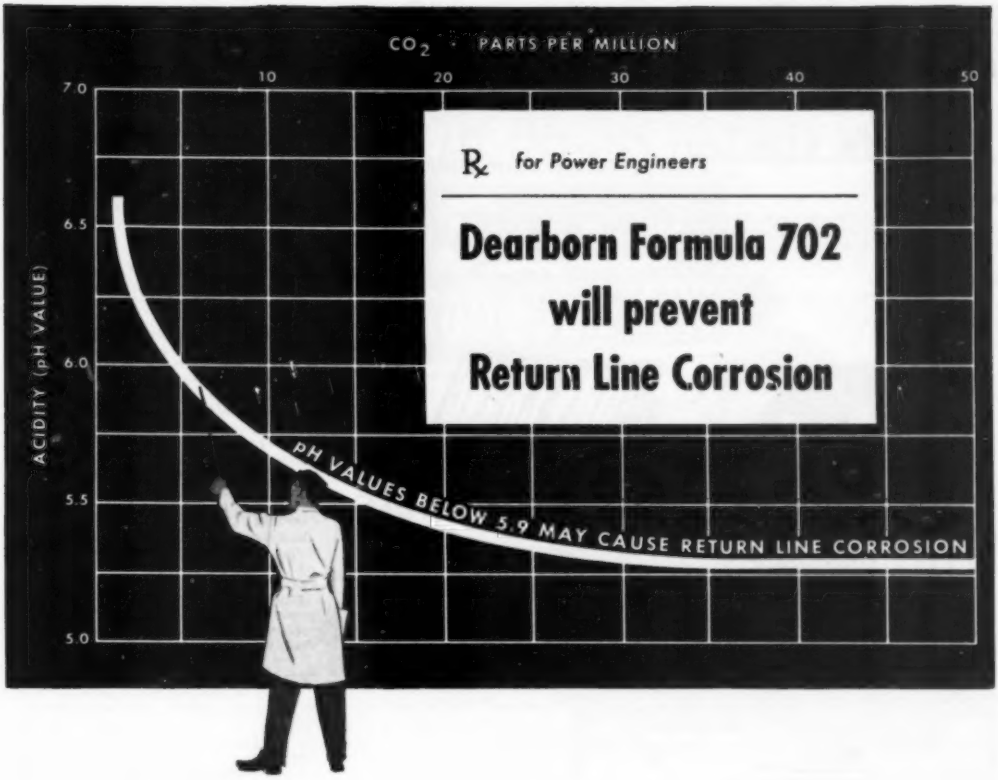
Steam Turbine Generators
Adv. page 48 contains information on Worthington steam turbine generators. Worthington Corp., Steam Turbine Div.

MECHANICAL POWER TRANSMISSION

V-Belt Sheave **540**
Bull V-1400-B7F contains data on Worthington multi-V-drives. Worthington Corp., Multi-V-Drive Sales Div. p 52.

Steel Collars **541**
Literature describes solid steel collars. Hallowell Power Transmission Div., Standard Pressed Steel Co. p 156.

(Continued on page 144)



What's the pH value of your boiler feed water? Chances are that if it's 5.9 or lower, you have return line corrosion—caused by excessive quantities of dissolved carbon dioxide and oxygen.

Corrosion caused by a low pH is effectively prevented with Dearborn Formula 702. This effective Dearborn treatment, which is introduced directly into the boiler feed water, works three ways. First, it forms a continuous amine film on the return lines to prevent corrosion. Second, this same film improves heat transfer, thus lowering the cost of steam production. Third, Formula 702 will automatically repair the film broken by rust scale separating from the pipe.

It will pay you to learn more about how Formula 702 will reduce excessive maintenance, avoid shutdowns, protect valuable equipment. Why not call your Dearborn Engineer today?

DEARBORN CHEMICAL COMPANY

Merchandise Mart Plaza • Chicago 54, Illinois

BASIC PATENTS

Dearborn holds the basic patents (U.S. Pat. 2400543) for the use of filming amines for treating water.

YOU'LL WANT A COPY OF THIS BULLETIN

Bulletin 5013, which outlines the causes of return line corrosion and the method of cure with Formula 702, will be sent on request.

Dearborn Chemical Company, Dept. INP
Merchandise Mart Plaza
Chicago 54, Ill.

☐ Send a copy of Bulletin 5013
☐ Have a Dearborn Sales Engineer call

Name.....

Company.....

Position.....

Address.....

City.....*Zone*.....*State*.....

Dearborn
TRADE MARK REGISTERED
THE LEADER IN WATER TREATMENT AND RUST PREVENTIVES

Readers' guide to advertised products

(Continued from page 142)

Roller Bearings 542
Information available on Hyatt Hy-Load roller bearings. Hyatt Bearings Div., General Motors Corp. p 56.

Grommet V-Belts
Adv. pages 39, 40, 41, 42 discuss Goodrich grommet belts. The B. F. Goodrich Co., Industrial Products Div.

V-Belts
Information on cog-belts and Thorobred V-belts. Dayton Rubber Co. p 59.

Flexible Couplings 543
Catalog and quick-finding selector charts on Lovejoy flexible couplings. Lovejoy Flexible Coupling Co. p 142.

PACKAGED STEAM GENERATORS

Packaged Boilers 544
Econotherm Bull EC-100C contains data on Dutton packaged boilers. Hapman-Dutton Co., Dutton Boiler Div. p 58.

Clayton Steam Generators 545
Catalog contains information on Clayton forced recirculation steam generators. Clayton Mfg. Co. p 129.

Superior Steam Generators 546
Cat 301 contains complete details on Superior packaged steam generators. Superior Combustion Industries, Inc. p 134.

Packaged Steam Boilers 547
Illustrated and descriptive Cleaver-Brooks steam boiler catalog available. Cleaver-Brooks Co. p 25.

Preferred Steam Generators 548
Bull 1000 contains details on Preferred unit steam generators. Preferred Utilities Mfg. Corp. p 140.

Packaged Boilers 503
Catalog gives facts on Powermaster packaged boiler with Vortiflow combustion. Orr & Sembower, Inc. p 58.

Self-Contained Generators 596
Steam-Pak's 208-page Architects' Manual is a complete reference on steam generators. York-Shipley, Inc. p 130.

PACKING AND GASKETS

Packings 549
Full details available on complete line of "John Crane" packings. Crane Packing Co. p 144.

Pumcups 550
Bull 4502 contains information on Darcova pumcups. Darling Valve & Mfg. Co. p 148.

Packing Tools 551
Dura-Hook Bull DHPL contains sizes and prices of hand-tools for removing old packing from stuffing boxes. Durametallic Corp. p 166.

Packings
Adv. p 46 contains information on R/M packings and gaskets. Raybestos-Manhattan, Inc.

Packings 552
Cat PC-101 gives complete information on Palmetto packings. Greene, Tweed & Co. p 146.

PIPE AND FITTINGS

Flexible Metallic Tubing 553
Bull 71 contains details on Penflex flexible tubing for all diesel applications. Pennsylvania Flexible Metallic Tubing Co., Inc. p 110.

Wing Unions 554
Catalog contains data on Weco wing unions. Well Equipment Mfg. Co. p 174.

Expansion Joints 555
Bull EJ-1912 contains data on gun-pakt expansion joints. Yarnall-Waring Co. p 70.

Air Hose
Adv. p 116 contains information on Republic Air Hose. Republic Rubber Div., Lee Rubber & Tire Corp.

Pipe Unions
Page 169 contains information on Dart Unions. Dart Union Co.

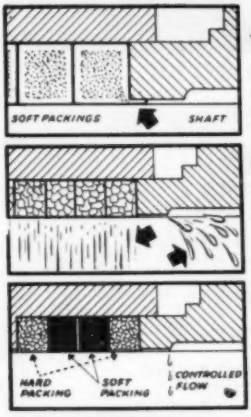
Pipe Fabrication
Adv. p 166 gives information on pipe fabrication for industrial requirements. Albert Pipe Supply Co.

Expansion Joints 556
Flexon expansion joints are described in new "Design Guide". Flexonics Corp., Expansion Joint Div. p 38.

Industrial Hose 557
Twin-weld hose (Bull H-4) and fire hose (Bull H-2). Hewitt-Robins, Inc. p 140.

Combination Sets

In the majority of cases, no one type of packing is 100% efficient. Therefore, "John Crane" recommends COMBINATION SETS to assure proper sealing. Here's why:



Straight soft packing used throughout permits end rings to squeeze into gland and throat clearances, thus sealing off the required amount of leakage needed to serve as lubricating film between shaft and packing.

Straight hard packing used throughout often is not sufficiently sensitive to gland pressure to control leakage within the desired limits. Also, the use of this single type of packing may result in scoring the shaft.

The right combination, however, of two types of "John Crane" packing offers better sealing, increased shaft life and less down-time in a variety of services. That's because soft inner rings are employed to provide a positive seal—yet allow Controlled Flow Lubrication, while harder end rings serve as a dam to stop inner ring extrusion.

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HERE'S THE RIGHT PACKING COMBINATION FOR CENTRIFUGAL CONDENSATE AND DRAIN PUMPS

End rings of "John Crane" twisted metallic packing Style 101-M and intermediate rings of "John Crane" Super Seal #1 is the combination best suited for steel shafted pumps handling hot water at medium pressures. Order a test set today and prove to yourself its advantages over your present packing.

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CRANE PACKING COMPANY
1831 CUYLER AVENUE • DEPT. 6 • CHICAGO 13, ILLINOIS

PUMPS

Motorpump **558**
Details available on I-R motorpump line. Ingersoll-Rand. p 124.

Pumps
Adv. p 114 contains information on Weinman pumps. The Weinman Pump Mfg. Co.

Pumps **559**
Specific data available on centrifugal, turbine, steam and power pumps. American-Marsh Pumps. p 156.

Aurora Pumps **560**
Condensed Cat "M" gives information on Aurora pumps. Aurora Pump Co. p 170.

Pumps **561**
Coupon offers literature on self-priming centrifugal pumps. Marlow Pumps. p 139.

Vertical Turbine Pumps
Adv. p 51 contains information on Worthington vertical turbine pumps. Worthington Corp., Vertical Turbine Pump Div.

Controlled Volume Pumps **562**
Bull 251 gives details on controlled volume pumps. Milton Roy Co. p 33.

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Peerless Pumps **563**
Engineering information available on Peerless type PRS process pumps. Peerless Pump Div., Food Machinery & Chemical Corp. p 153.

REFRACTORY CONCRETES

Refractory Cement **564**
Bull R-53 describes Super 3000 Refractory cement. Refractory & Insulation Corp. p 147.

SOOT BLOWERS & TUBE CLEANERS

Blowers **565**
Bull 1035AA contains data on Model IK long retracting blowers. Diamond Power Specialty Corp. p 18.

Tube Expanders **566**
Bull 380 presents data on Wilson tube expanders. Thomas C. Wilson, Inc. p 176.

Tube Cleaners & Expanders **567**
Full details on Airetool tube cleaners and expanders. Airetool Mfg. Co. p 163.

Tube Cleaners **568**
Details available on Rotojet tube cleaners. Elliott Co., Roto Div. p 167.

STEAM SPECIALTIES

Traps **569**
Cat 68-J describes complete line of Strong steam specialties. Strong, Carlisle & Hammond Co. p 181.

Bucket Traps **570**
Full information available on Hoffman bucket traps. Hoffman Specialty Co. p 130.

(Continued on page 148)

Cummins Diesels

ARE PRECISION TENSIONED WITH

Snap-on* TORQOMETERS

Each Cummins Diesel is built not once, but twice.

One of the big reasons for the high reputation of Cummins Diesels is the *extra* care Cummins uses in building its engines. For example, each Cummins Diesel is run in after assembly, then completely disassembled for reinspection. Then it is carefully reassembled and tested again. In *both* assembling operations, Snap-on Torqometers are used to assure complete accuracy of tensioning.

When precision machinery is assembled with bolts, mechanical distortion and excess wear of moving parts often occur if bolts are tightened to unequal or improper tension. To insure correct bolt tensioning, use Snap-on Torqometers . . . accurate as a watch, yet so easily read that even inexperienced workers can use them.

Snap-on Torqometers are built in 15 standard models, capacity from 0 to 30 inch-pounds up to 2,000 foot-pounds. At-your-elbow service from factory branches in 42 important industrial centers. Write for the Snap-on Industrial Catalog and the 104-page General Catalog of more than 4,000 Snap-on hand and bench tools for production and maintenance.

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PALMETTO CUTNO® and a DeLaval IMO

team up to resist caustic bite for American Viscose Corp.

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packing more performance into every application

GREENE, TWEED & COMPANY
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Readers' guide to advertised products

(Continued from page 145)

Steam Traps **571**
Booklet "Solving Steam Trap Problems" contains useful information. The V. D. Anderson Co. p 178.

Illinois Steam Traps **572**
Bull 35 contains data on Illinois steam traps. Illinois Engineering Co. p 156.

THERMAL INSULATION

Heat Insulation **573**
Free book available on "Kaylo Heat Insulation". Owens-Illinois Glass Co., Kaylo Div. p 106.

Insulating Cement **574**
Coupon on page 118 contains complete data on Black Rockwell insulating materials. Baldwin-Hill Co.

TOOLS

Masonry & Concrete Saws **575**
Page 151 contains coupon for free literature on masonry and concrete saws. Clipper Mfg. Co.

Torqometers **576**
Information given on models and sizes. Production and maintenance tool catalogs available. Snap-On Tools Corp. p 145.

RODA — High grade gas, by-product, steam and household stoker coal from Wise County, Virginia, on the Interstate Railroad.

KENDRICK — High grade gas, by-product, steam and domestic coal from Wise County, Va., on the Interstate Railroad.

STONEGA — High grade, high volatile steam and by-product coal from Wise County, Va., on the Interstate Railroad.

GLENBROOK — The Premium Kentucky High Splint unmatched for domestic use. Produced in Harlan County, Kentucky, on the L. & N. Railroad.

COKE — Roda and Stonega from Wise County, Va.

CRITERION COAL — High grade gas, by-product, steam and domestic coal—Pittsburgh seam from Irwin Basin, Westmoreland County, Pennsylvania, on the Penna. Railroad.

HAMPTON COAL — High volatile domestic, steam and by-product coal from Boone and Logan Counties, W. Va., on the Chesapeake & Ohio Ry.

CROZER — Genuine Pocahontas from McDowell County, W. Va., on the Norfolk & Western Railway.

LYNCO — High fusion coking coal for by-product, industrial stoker and pulverizer use from Wyoming Co., W. Va., on the Virginian Ry.

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NEW YORK NORFOLK PITTSBURGH

Valve & Bibb Reseater

Page 168 contains data on Skinner valve and bibb reseater. M. B. Skinner Co.

Blower Suction Cleaner

Adv. p 175 shows five uses for Clements-Cadillac portable blower-suction cleaner. Clements Mfg. Co.

TURBINES

Turbines 577

Bull S-146 contains information on Terry multistage turbines. The Terry Steam Turbine Co. p 54.

Turbines 578

Book B-3896 describes type E turbines. Westinghouse Electric Co. page 111.

VALVES

Blow-Off Valves 579

Bulletin describes boiler blow-off valves. Everlasting Valve Co. p 160.

Diaphragm Valves 580

Cat V-52 contains data on Saunders patent diaphragm valves. Hills-McCanna Co. p 171.

Butterfly, Slide Valves 581

Catalog describes rubber-lined metal valves with manual or automatic control. W. S. Rockwell Co. p 164.

Pump Valves 582

Catalog gives 4 ways to cut pump repairs. Sims Pump Valve Co., Inc. p 162.

Check Valves 583

Bull WH-100 contains data on Williams-Hager flanged silent check valves. The Williams Gauge Co. p 154.

Blow-Off Valves 584

Bulls B-425 and B-433 contain complete data on Yarway seatless blow-off valves. Yarnall-Waring Co. p 16, 17.

Check Valves 585

Cat 30 contains complete information on Chapman tilting disc check valves. Chapman Valve Mfg. Co. p 66.

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Pressure Regulator Valve

Adv. p 7 contains information on No. 960 pressure regulator valve. Crane Co.

Corrosion-Resistant Valves

See adv. p 19 for information on Aloyco corrosion-resistant valves. Alloy Steel Products Co., Inc.

WATER TREATMENT

Return Line Corrosion 587

Bull 5013 outlines causes of return line corrosion and describes its control. Dearborn Chemical Co. p 143.

Boiler Water Comparator 588

Free handbook "Modern pH and Chlorine Control" describes Taylor boiler water comparators. W. A. Taylor and Co. p 6.

Water Treatment 586

Bulletins contain complete data on Elgin deionizer. Elgin Softener Corp. p 123.

Water Treatment 589

Available ASME paper, "Correlation of Silica Carry-over and Solubility Studies." National Aluminate Corp. p 11.

Water Treatment 590

Details on demineralizing plant are offered. Hungerford & Terry, Inc. p 170.

Water Conditioning

Adv. p 49 contains data on Worthington water softening systems. Worthington Corporation., Water Treating Div.

Ion Exchangers 591

Bull 28X7808 describes alkalinity reduction by ion exchange. Allis-Chalmers Mfg. Co. p 133.

Water Treatment 592

Information available on the use of organics for boiler water treatment. Power Chemicals Div., E. F. Drew & Co., Inc. p 67.

Dealkalization Process 593

Complete details available on new process for softening and dealkalizing water. American Water Softener Co. p 34.

Water Softener 594

Bull 4801 gives details on hot process zeolite softener. Cochrane Corp. p 57.

Waste Treatment 595

Bulletin 850A discusses Cyclator used to clarify wastes. Infilco Inc. p 35, 36.

—End

No Refractory Cement Ever Like It for Bonding or Patching

Brickwork in Furnace and Boiler Linings, Settings, Floors, Doors, Arches, Baffles, Jambs

√ Sets Harder — √ Bonds Stronger

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Where service is severe, where repairs are frequent, you can reduce your maintenance troubles and expense by bonding or patching with Super #3000.

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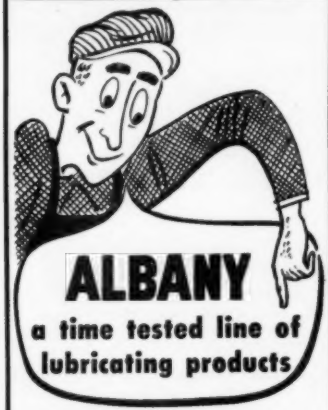

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For Cups — Ball Bearings — Water Pumps — Universal Joints. Waterproof — Exceptionally high melting point. Soft enough for gun application.

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A cooling lubricant for operating temperatures from 110° F to 200° F.

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Quick-acting. Cuts rust as well as lubricates. Loosens sticky valves, eliminates squeaks.

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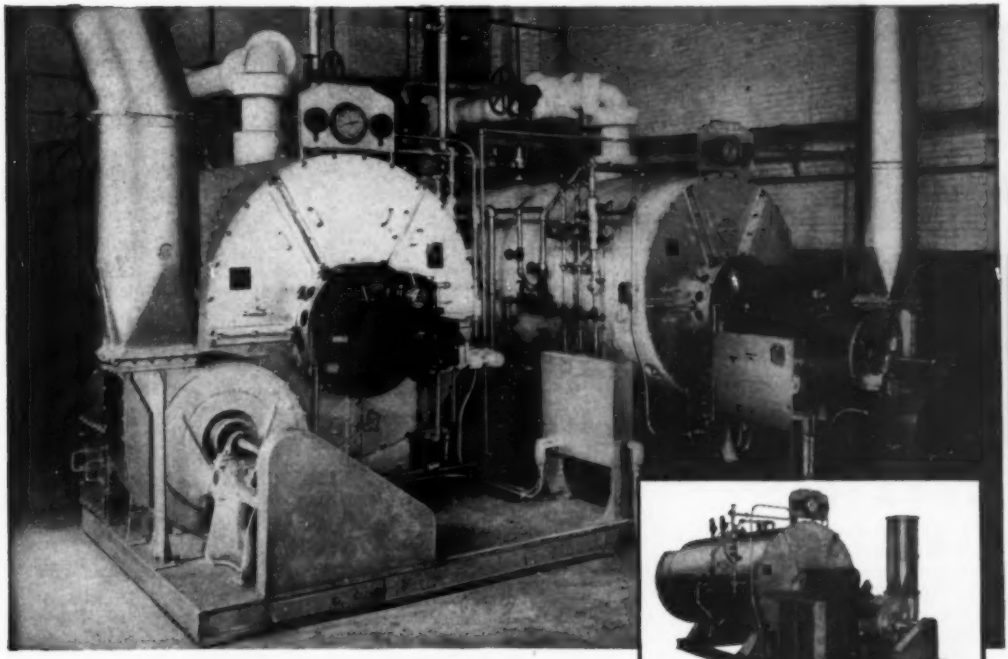
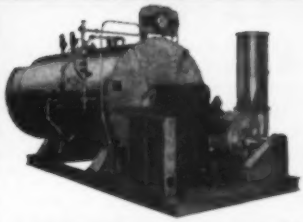
Habitant Soup Co. Cuts Steam Costs 35%

with Preferred Units





Here's what the Habitant Soup Co. of Manchester, N. H., reports: *"More than two years ago we installed two Preferred Unit Steam Generators and we're frankly amazed at the small amount of fuel they consume to produce more than enough steam for our requirements. In fact, they cut our fuel bills by 35%.*

"Maintenance of the Preferred units is practically nil because they are fully automatic. We're glad to report that both boilers are working like a charm."

There are a host of good reasons for these savings. Fuel costs go down, for example, because Preferred Unit Steam Generators offer fully automatic operation with inexpensive No. 6 oil. But Preferred units assure *even more* than appreciable, immediate returns on your investment. They are designed to give *continuing economical* operation for at least 25 years.

For proof, read the 25-year features in the panel at right. For full details, send for Bulletin 1000.

PREFERRED UTILITIES MFG. CORP.
1860 BROADWAY, NEW YORK 23, N. Y.

8 PREFERRED 25-YEAR FEATURES

- **4-pass, high velocity, gas travel—minimizes tube cleaning maintenance by self-cleaning action.**
- **Staggered tube construction—minimizes the possibility of tube pitting, even at low firing rates.**
- **Preferred-built 4700 rpm Horizontal Rotary Oil Burner—assures fully automatic operation even with No. 6 oil.**
- **Anti-stress deck for tube sheet protection.**
- **Self-cleaning *induced draft* fan with air cooled shaft and bearings—built to last 30 years.**
- **Down-draft gas travel for 80% thermal efficiency—proved and guaranteed.**
- **Special *precipitator* developed by Preferred as aid to safe and clean operation.**
- **Dual purging cycles for positive elimination of gas stratification.**

PR-101

PREFERRED UTILITIES MFG. CORP.

THIS G-E CLEANER
Helps you *Save Money*
Helps you *Save Time*

THESE modern, G-E Heavy-duty Cleaners have many special features:

- They help you cut cleaning time . . . a sure way to cut maintenance costs.
- They switch quickly and easily from wet to dry pickup . . . powerful motors pick up mop water, dust, coarse litter with equal ease.
- They have extra-wide nozzles to cut the cleaning time of larger areas.
- They convert in a moment to *powerful blowers* for quick gathering of scrap into convenient piles for salvage or disposal.
- They have special attachments for cleaning high, hard-to-reach areas thoroughly and quickly.

These are but a few of the features that make G-E industrial cleaning equipment so productive.

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Heavy-Duty Cleaning Equipment

GENERAL ELECTRIC

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Without obligation, please send complete details on heavy-duty cleaning equipment.

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FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Spot news

(Continued from page 118)

Two Diesels Roll Up 185,000 Engine Hours in Pipeline Service

In less than a dozen years, two diesels in Magnolia Pipe Line Company's Anthony Station have operated a combined total of more than 185,000 engine hours. The station, near Anthony, Ind., is one of eight on Magnolia's 10 in. pipeline extending from Patoka, Ill. to Lima, Ohio. The diesels have operated 89 per cent of the elapsed time with an average of only 15 days a year for all maintenance.

The diesels are 6 cylinder, 4 cycle McIntosh and Seymour units, manufactured by American Locomotive Co. Having a 12½ in. bore and 13 in. stroke they are rated 405 hp at 450 rpm. Each drives, through speed increasing gears, a Worthington 4-stage centrifugal pump with rated capacity of 1400 gpm for 905 ft total discharge head at 2900 rpm.

Both pumps and diesels are operating below designed capacity—normally 540 hp at 600 rpm for the diesels. Output can therefore be increased by merely speeding up the engines. In addition, capacity can be increased to 810 hp by the use of an exhaust turbocharger.

Although operating economy is not ignored, emphasis is on continuity of service. In the absence of standby equipment, engines must meet the rigorous operating demands of refinery schedules. To meet these requirements company engineers have chosen heavy-duty prime movers, good protective accessory equipment, and have adopted a methodical program of preventive maintenance. Valves are ground every 14 weeks, and each station has a set of six extra heads which can be switched to allow the return of an engine to service within 2 hr. A fuel injection nozzle can be replaced in 10 min. Pistons are pulled only when necessary, some engines having run 2½ years between such servicings.

For fuel, crude oil is taken from the line, centrifuged, and stored in a 270 bbl tank. The 12 year average of fuel consumption at this plant shows that more than 1800 bbl of fuel oil have been pumped per bbl of fuel consumed.

—End

Need DRY AIR?

Get *positive* protection with Strong's Combination Separator and Trap!

Spray guns, air chucks, fixtures and other air-using equipment, *must* be kept free of water and oil for best results. Strong's Combination Separator and Trap will completely separate all liquids from air (or steam) and automatically discharge them.

CHECK THESE FEATURES:

★Highest operating efficiency;
★No cleaning required;
★Copper-clad steel float (stainless steel at additional cost);
★Anum-Metl seat and disc—guaranteed leakproof for one year;
★Sizes from ½ to 1½ inches, screwed; pressures to 250 psi.

Other products in the *complete* STRONG Steam Specialties line include steam traps, strainers, separators, pressure regulators and continuous blow-down valves. For complete information, write for your copy of our new Catalog 68-J today, or see one of our over 200 distributors.

STRONG, CARLISLE & HAMMOND COMPANY
1392 West 3rd Street
Cleveland 13, Ohio
ANUM-METL Reg. Trade Mark

OTHER STRONG STEAM SPECIALTIES

Reducing Valve

Inverted Bucket Trap

Air or Vent Trap

STRONG

NOW! An ABRASIVE BLADE
VIRTUALLY UNBREAKABLE!

FOR THOSE "TOUGH" CUTTING JOBS

Clipper "SAILS RIGHT THRU"
"CBR" (BREAK-RESISTANT)
BLADES

for . . .

MASONRY SAWS

HAND POWER SAWS

FLEXIBLE SHAFT SAWS

BEND—DROP—or TWIST in the cut . . . they're Virtually Unbreakable! Yes, Clipper "CBR" Blades are STRONG and SAFE and even more surprising the blade life is 50% to 100% longer than regular blades. It is not recommended for hard vitreous materials but rather the softer ranges of masonry. The most intricate cutting or grooving is now possible on Hand-Power Saws or Masonry Saws. Write today for prices and recommendations on this newest Dry Abrasive blade. Available in all diameters, arbor shapes and sizes.

DIAMOND and ABRASIVE BLADES for Any MASONRY or CONCRETE CUTTING

There's a Clipper Blade to cut your Brick, Glazed Tile, Fire Brick, Concrete block and Floors, Natural Stone, Glass and Porcelain. Available in sizes from 6" to 30". Choose Genuine Clipper for the FASTEST — CHEAPEST and LONGEST LASTING masonry cutting.

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New bulletins and catalogs

Literature on engineering products and developments

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AIR & DUST FILTERS & COLLECTORS

Cloth Type Collector **200**

"The Control of Industrial Dust," 28-page booklet 909A, was written to aid the engineer in determining if the dust problem in his plant warrants control. Operation of cloth type filters are described as an example of modern control. Advantages, specifications, construction, engineering data and case histories are also presented. Pangborn Corp.

Exhaust Hoods **201**

"Manual of Exhaust Hood Design," 24-page brochure 270-E1, illustrates and discusses exhaust hoods for many operations in the metal working industries. In addition, dynamic and hydrostatic dust precipitators and systems for control of oil mist are discussed. Engineering data are given in tabular form. American Air Filter Co., Inc.

Gas Scrubber **202**

Six page bulletin 203-B features a gas scrubber to clean, cool or absorb gases. Applications, advantages and operating principles are discussed and illustrated with typical installation photos, cross-section diagrams, and capacity curve sheet. Peabody Engineering Corp.

Cloth Type Collector **203**

Bulletin 322 reports the application of cloth type dust collectors to the manufacture of roofing materials. Special attention is given to ventilation of mica and scrap recovery. Photos present case histories and flow diagrams show sequence of operations. American Wheelabrator & Equipment Corp.

Cloth Bag Collector **204**

Features and principles of operation of a high efficiency cloth bag dust collector are described and illustrated in 8-page bulletin 914. Hoppers, hopper valves, structural supports and mountings are also presented. Standard sizes and dimensions are listed. Pangborn Corp.

ANTI-CORROSIVE & PROTECTIVE COATINGS

Protective Coatings **206**

If the floors, walls, ceilings or structural steel of your plant are subject to chemical corrosion, you may find data sheet 501 useful. Resistance of manufacturer's line of protective coatings to practically all commonly used corrosive chemicals is listed in chart form. Coatings are also used for equipment such as tanks, pipes, ducts and machinery. Prufcoat Laboratories, Inc.

Maintenance Coatings **207**

Coatings for plant maintenance are described in 4-page folder. Products are listed for skid-proofing, rust prevention, painting over damp areas, weatherproofing and decoration of exterior masonry, interior waterproofing, painting over hot surfaces and protection against acids and chemical fumes. United Laboratories, Inc.

BATTERIES & CHARGERS

Battery Chargers **208**

Single circuit motor-generator chargers for industrial batteries are described in 4-page folder 10-210. Units are self-contained and do not require manual attention during charge. Selection charts are included. The Electric Products Co.

Maintenance Chart **209**

Procedures to be followed for basic battery maintenance are tabulated in wall chart form, GB-1450. Rules are established for charging, adding water, cleaning, keeping records, locating, installing and connecting. Five cartoons add interest to the chart. Gould-National Batteries, Inc.

BUILDING HEATING, VENTILATING & AIR CONDITIONING & REFRIGERATION

Filters **210**

Construction, advantages, specifications and performance data of ventilation and air conditioning filters are outlined in 8-page bulletin 100. Automatic, dry panel, grease, viscous panel and spray booth types are featured. Dollinger Corp.

Smoke Indicators **211**

Panic caused by accidental introduction of smoke into air conditioning systems can be averted by use of smoke control alarms, according to 4-page folder 521. Details of three models of control units are outlined. Ess Instrument Co.

Unit Heater Maintenance **212**

"The Care and Maintenance of Steam and Hot Water Unit Heaters," illustrated 4-page folder 12, lists proper maintenance procedures for unit heaters. Causes of trouble and their prevention are also presented. Industrial Unit Heater Association.

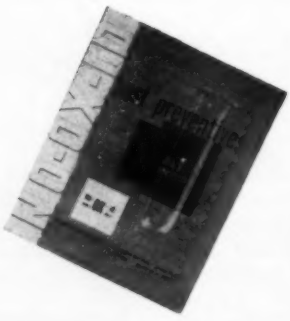
Humidifiers **213**

Advantages of humidified air are discussed in 12-page brochure 1773. Several humidifiers are presented, using diagrams to show method of installation. Actual installations are illustrated and described. Information on how to select proper unit is included. Armstrong Machine Works.

(Continued on page 154)

Rust Preventatives **205**

Prepared to assist in solving corrosion problems, this 72-page catalog 3076 presents rust preventatives for production and maintenance. Indexed for quick reference, coatings include oil, grease or wax, solvent cutback and drying types. In addition rust removers and pipe wrapper and filler are discussed. Data on selection of proper coating, properties, preparation of surface, application and removal are presented. Typical applications are illustrated. Also included is a check-chart and diagram to aid in making your own survey to determine where rust may be attacking your plant. Dearborn Chemical Co.



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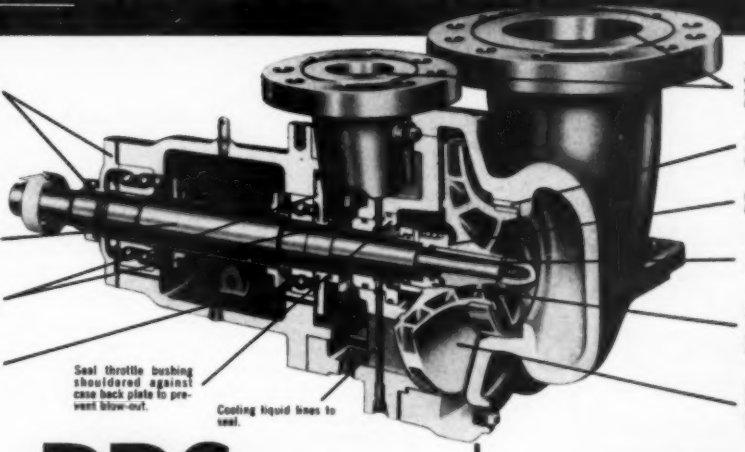
A HEAVY DUTY REFINERY & CHEMICAL PROCESS PUMP DESIGNED *WITH AND FOR* A MECHANICAL SHAFT SEAL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The Peerless Type PRS pump is designed *specifically* for mechanical shaft seal construction. All the advantages of proved mechanical seals are inherent in the Type PRS pump design.

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4. AVAILABLE IN SEVERAL SIZES. Peerless Type PRS pumps are available for quick assembly and shipment from Peerless' Los Angeles stock in several sizes.

5. ENGINEERING CONSULTATION SERVICE. Help on selection and application of the Type PRS pumps to your problems is available from the Peerless factory or the Peerless field engineer or distributor nearest you.

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Characteristics AT A GLANCE

Capacities	up to 1000 gpm
Operating Heads	up to 625 feet
Case Pressures	up to 400 psig
Temperatures	up to 250° F
Drives	horizontal electric motor is standard; other types available as required.

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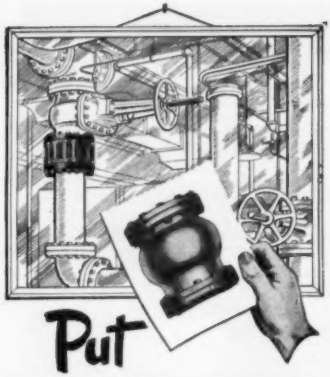

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New bulletins and catalogs

(Continued from page 152)

General Catalog **214**

For quick reference, 60-page catalog 600 is divided into three sections. Equipment section outlines specifications, dimensions and descriptions of Westinghouse-Sturtevant products for air handling, air conditioning and air cleaning. Application section tells how to put air to work by relating equipment capabilities to job requirements. Data section features tables, charts and useful data for proper selection of equipment. Westinghouse Electric Corp.

Power Plant Ventilation **215**

Ventilation and air conditioning for the boiler room, turbine room, switchgear bay and control room of a power plant are discussed and illustrated in 4-page reprint R-9. Title of article is "Ventilation and Air Conditioning at Florida Power's Higgins Plant." The Kuljian Corp.

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CONTROLS, REGULATORS & INSTRUMENTS

Centralized Instrumentation **216**

Conventional and graphic type panelboards designed for many industries are portrayed in 32-page booklet 85-20. In addition, measuring and control instruments utilized in centralized instrumentation are discussed. Minneapolis-Honeywell Regulator Co., Brown Instruments Div.

Electronic Instruments **217**

Electronic potentiometers and bridge instruments are featured in 36-page catalog P1245. Information is given concerning electronic instruments for recording and indicating such variables as temperature, pH, speed, voltage, power, current, smoke density, thickness and strain. In addition to single and multiple point recording units, pneumatic and electric-operated automatic control units are described. The Bristol Company.

Regulating Valve **218**

Design features, performance and specifications of double seated, diaphragm regulating valves for use with control instruments are described in 4-page folder 513. Cooling bonnets are available for over 500 F and under 30 F. Leslie Co.

Process Controllers **219**

Advanced principles of automatic control are dealt with in 32-page bulletin 461. Eight basic types of controllers are featured, including single action, dual, duplex, auto-selector, ratio, relation, pneumatic set and time schedule. In addition to descriptions and specifications of units, controller air connections, dimensions, measuring elements and safety shutdown systems are presented. The Foxboro Co.

Combustion Controls **220**

Air-operated combustion control systems for gas or oil firing, and their component parts, are presented in 24-page brochure 1023. Diagrams show nine typical firing methods. Facts and figures on 300 installations ranging from 6000 to 1,000,000 lb per hr are listed. Bailey Meter Co.

Temperature Regulators **221**

Temperature regulators for control of steam used in equipment such as heaters, tanks and processing units are presented in series of data sheets. Includes specifications, advantages, information on selection, how they work, typical installations and maintenance. Farris Stacon Corp.

Instrumentation **222**

"Fundamentals of Instrumentation for the Industries," 130-page booklet 80-2, should make a valuable addition to your engineering library. Chapters include fundamentals of measurement and control, measurement of process variable, remote transmission of measurements, types of controllers, control systems, and typical applications. Illustrations are used to supplement text. Minneapolis-Honeywell Regulator Co., Brown Instruments Div.

Low Pressure Regulator **223**

Design features and advantages of low pressure regulators are presented in data sheet 150. Pressure range is 0-75 WSP with valve body sizes of 1½ and 2 in. Stets Co.

Temperature Controls **224**

Automatic control of temperatures is discussed in 12-page catalog G-17. Electric and pneumatic controllers for temperatures from -300 to 1800 F are featured. How they operate, applications and performance are outlined. Burling Instrument Co.

Combustion Indicator **225**

Advantages of using a combustion indicator to measure haze or smoke are described in data sheet 801. An electric unit is offered. Specifications and installation data are included. Ess Instrument Co.

BOILERS & BOILER ACCESSORIES

Blowdown Separators **226**

Advantages of centrifugal blowdown separators are discussed in 4-page folder 30. Diagrams show common methods of installation. Table of dimensions and dimensional drawings are included. Wilson Engineering Corp.

Bent Tube Boilers **227**

Two drum, bent water tube boilers are the subject of 14-page brochure. Low head types are included. Furnaces are designed for various types of firing, and water walls are available. Presentation is by specifications and side elevation drawings of actual installations. Henry Vogt Machine Co.

COAL, ASH & BULK HANDLING

Conveying Systems **228**

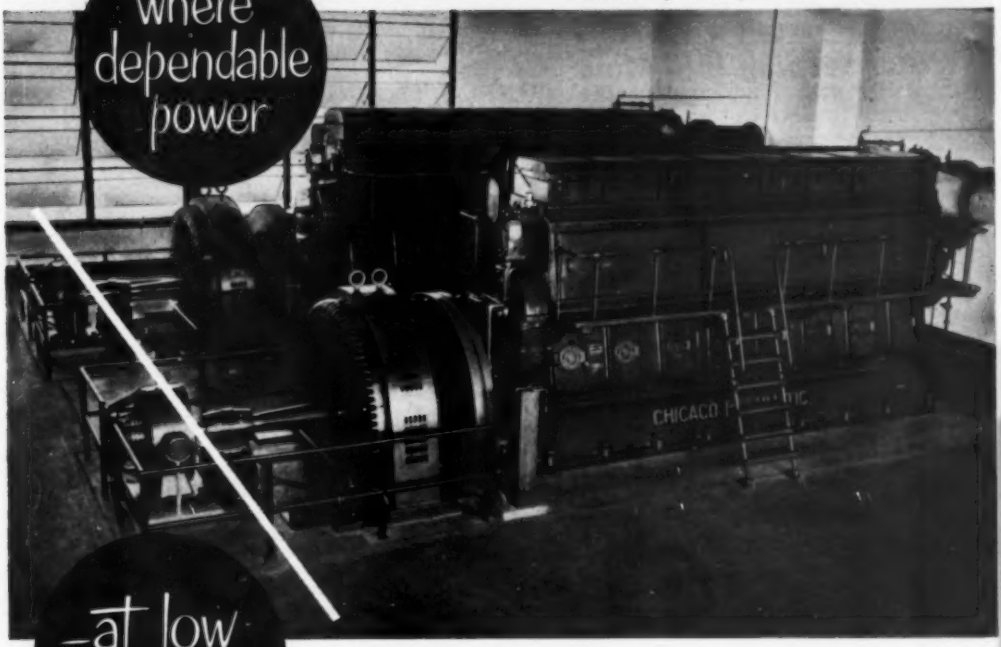
Four basic types of systems for conveying dry pulverized, crushed and granular materials are discussed in 8-page bulletin G-1. Typical applications are illustrated. Auxiliary equipment is also presented. Fuller Co.

Conveyer Belting **229**

How to lay out conveyer and elevator drives and specify the proper belt is explained in 30-page catalog NY-1697-C.

(Continued on page 157)

Two CP 1500 hp Diesel Engines in a western public utility station.



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CP ENGINES, for straight Diesel, Dual Fuel, or Gas operation, have earned an enviable reputation for providing thoroughly dependable power at low cost. They are widely used in public utility stations, municipal power plants, institutions, petroleum pipeline stations, and in many kinds of industrial plants.

They are particularly suitable for voltage booster stations at the end of long transmission lines; for emergency hook-ups during power line repairs and replacements; for local generating plants in isolated areas; as well as for furnishing power in central stations.

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PRODUCTION INTERRUPTED
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Water Seeping Into Mine
Mine Water Level Drops
B
Certain-teed Products Corporation
C
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American-Marsh Pumps, Inc.
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Battle Creek, Michigan
Dear Sir:
We would like to express our appreciation for the splendid co-operation that both you and Mr. Burke rendered in getting to us the pumps which have materially assisted us in avoiding a disaster in our mine. There was marvelous teamwork all the way around in your company getting these things done for us. We certainly appreciated it.
Very truly yours,
CERTAIN-TEED PRODUCTS CORP.
A. R. Van Kleef
Plant Manager

Exhibits A, B and C tell the story . . . of how disaster was forestalled at this *Certain-teed* mine . . . because American-Marsh Pumps—and Personnel—were "ready, willing and able" to *cope with customers' problems.*

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SOLID STEEL COLLARS

Precision machined for shafts from 3/16" to 3" diameter inclusive. Fitted with the famous self-locking UNBRAKO Socket Set Screw—the screw that positively won't work loose. Write for descriptive literature and the name of your local distributor. STANDARD PRESSED STEEL CO., Jenkintown 39, Pennsylvania.

HALLOWELL POWER TRANSMISSION DIVISION

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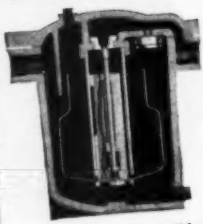
ILLINOIS Steam Trap



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New bulletins and catalogs

(Continued from page 154)

Data on carrying capacities, horsepower factors and pulley diameters are listed in quick reference table form. New York Belting & Packing Co.

Pneumatic Conveyers **230**

Bulk materials handling in process industries, using suction and pressure type pneumatic conveyers, is discussed in 24-page booklet 529. Layout drawings and case histories of installations in various industries suggest applications. Accessories are also presented. Dracco Corp.

Conveyers **231**

Typical layout drawings, engineering data, calculation tables, charts and formulas for conveyer units developed for mechanical handling of bulk flowable materials are presented in 28-page booklet 2475. Units serve as self-feeding conveyers and conveyer-elevators in one fully enclosed assembly. Link-Belt Co.

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Crushers **232**

Crushers for lump materials such as coal, coke, gypsum, lime and metal turnings are described in 16-page bulletin 12-C. Included is the recently developed Knittel ring type for wet coal and sticky materials. Specifications and dimensions are listed, drawings show construction, and information on selection of equipment is presented. Conveyer belts and carriers, bin level switches and ball bearings are also included. Stephens-Adamson Manufacturing Co.

Bin-Level Control **233**

Normal duty, explosion proof and heavy duty bin-level control switches are discussed and illustrated in 4-page folder 11-0. Applications, specifications and wiring details are presented. Stephens-Adamson Manufacturing Co.

Four-Rope Buckets **234**

Users of overhead or bridge type cranes with four-rope bucket trolleys will be interested in 44-page bulletin 2392. In addition to discussions and illustrations of buckets, reeving and sheave bearings, the booklet also presents information on methods of selection and uses of the equipment. Blaw-Knox Co., Blaw-Knox Div.

BUILDING MATERIALS & MAINTENANCE

Concrete Additive **235**

Folder describes chemical added to concrete to produce longer wearing floors, resistant to acid, water, oil and grease. Flexrock Co.

Fluorescent Lighting **236**

"The Why, When and How of Modern Lighting Maintenance," 12-page bulletin, emphasizes the high cost of low mainte-

(Continued on page 158)

Large, readable scales . . . durable, all-metal construction . . . stainless steel stems . . . accuracy within 1% of thermometer range. Available in types, sizes, stem lengths and ranges for all applications. Write for literature. WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, N. J. . . . manufacturers of Weston and TAG instruments.

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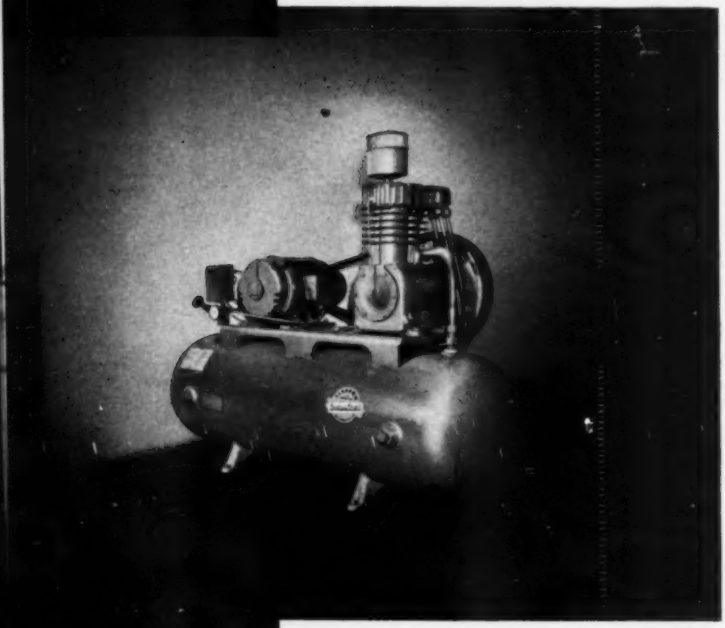

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SIZES—½ HP to 5 HP

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ALL-NEW FEATURES:

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Larger radiation fins.

Bucket-high drain for ease of use!

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SCHRAMM, INC.

The Compressor People

WEST CHESTER • PENNSYLVANIA

SCHRAMM INDUSTRIAL AIR COMPRESSORS

New bulletins and catalogs

(Continued from page 157)

nance standards. An eight step program of planned fluorescent lighting maintenance is suggested. Sylvania Electric Products Inc., Lighting Div.

FUELS & FIRING EQUIPMENT

Burners **237**

Combined gas and oil burners are described and illustrated in 4-page folder 205A. Advantages and construction features are presented, along with descriptions of important working parts. Peabody Engineering Corp.

Spreader Stokers **238**

Construction details and specifications for spreader stokers are presented in 16-page bulletin SB-42. Dumping grate and continuous ash discharge types are featured. Photos show component parts. Side elevation drawings show actual installations. Erie City Iron Works.

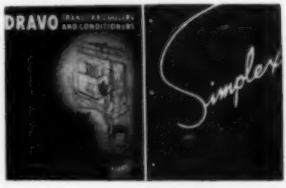
Heater Safety Control **239**

Design theory of a safety control used in conjunction with fuel oil heaters is described in 6-page bulletin 60K. The unit is used to detect contaminants in boiler water or condensate. Installation instructions are included, as well as tables of capacity, dimensions and weights. Standard specifications and piping hookups are also presented. Davis Engineering Corp.

CRANES, HOISTS & CAR PULLERS

Crane Cab Coolers **240**

Specifications, dimensions and details of construction for coolers and air conditioners designed for use in crane cabs are presented in 24-page booklet 1301. Typical applications are pictured. Dravo Corp.



ELECTRICAL DISTRIBUTION

Wires & Cables **241**

Tabulated for quick reference, 16-page catalog briefly describes and illustrates wires and cables for many purposes. Discussions of conductor strandings and protective coverings are also presented. Wire and cable selector table lists required services, recommended product, and types of insulation and covering recommended. Simplex Wire & Cable Co.

Cable Troughs **242**

Standard cable troughs, fabricated from ¾ in. diamond-shaped steel mesh, are described and illustrated in 6-page folder 64B. Standard widths are 6, 12 and 18 in. Fittings are also shown. T. J. Cope Inc.

Circuit Controller **243**

Direct-acting, finger-type voltage and current regulators are analyzed in 12-page bulletin 505.00. Functions and advantages

are described as well as applications, principles of operation and performance. How units are used in servo systems is also explained. Electric Regulator Corp.

Switchgear **244**

Low and medium voltage types of switchgear are the subject of 8-page catalog 521. Applications and basic specifications as well as panels, components and construction are described. Other products made by the company are also listed. Electric Service Engineering Co.

Capacitors **245**

Power factor correction capacitors are dealt with in catalog 27. Divided into four sections, section I gives general information on applications and locations, with general standards and specifications. Section II details individual units, section III is devoted to rack type assemblies and IV lists pole types. John E. Fast & Co.

Resistors & Rheostats **246**

Specifications and descriptions of wirewound resistors and rheostats are presented in 24-page catalog D-130. Types for numerous applications are described. Basic resistor formulas are also presented. Ward Leonard Electric Co.

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D-C Power Supply **247**

Described in 4-page folder V1031 is a unit which supplies a source of variable stabilized-regulated d-c voltages, operating from a-c power lines. How it works, advantages, applications and operation are discussed. The Superior Electric Co.

Circuit Breakers **248**

History of modern circuit breakers and fundamental operating principles are included in 36-page booklet B-5407. Eight basic types of units are outlined, including construction details, ratings, dimensions and typical applications. All engineering data required for proper selection of equipment is included. Westinghouse Electric Corp.

Power Terminals **249**

Power terminals and connectors for sizes from No. 6 to 4/0 are presented in 20-page brochure. Also described are tools designed for crimping the terminals. Tools include hand hydraulic, pneumatic and electric-hydraulic types. Includes useful tables compiled to assist in terminal selection. Aircraft-Marine Products Inc.

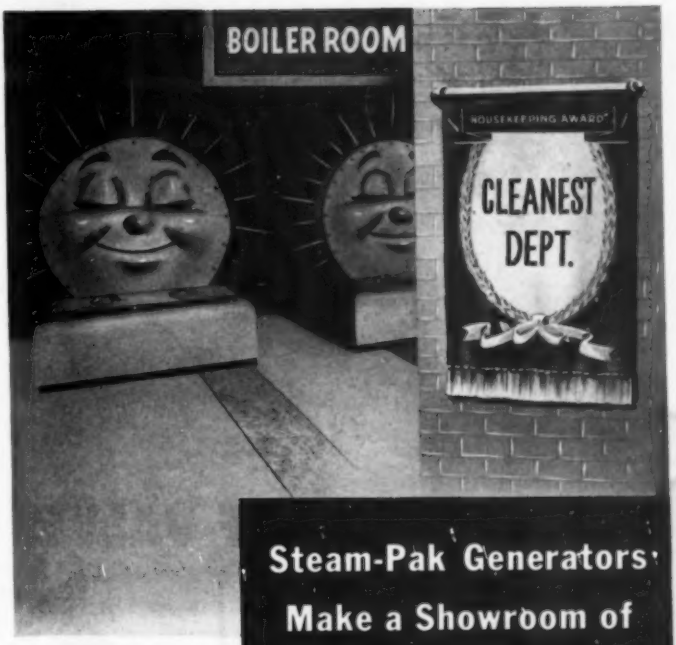
Switchgear **250**

Low voltage, metal enclosed switchgear assemblies for outdoor and indoor applications are described in illustrated 30-page booklet B-5282. Advantages, features of construction, application data and specifications are included. Current ratings, interrupting ratings, inspection, disconnection and replacement data are also presented. Westinghouse Electric Corp.

Busway Systems **251**

Design characteristics, salient features and application advantages of feeder distribution systems used for lighting, flexible crane and hoist circuits and for portable electric tools are described in 56-page catalog TEB-2. Component parts, layout data, specification and dimensional data are also presented. Trumball Electric.

(Continued on page 160)



Steam-Pak Generators Make a Showroom of Your Boiler Room

Cleanliness in the boiler room indicates efficient operation—a major feature of Steam-Pak Generators.

Efficiency in the boiler room is giving many Steam-Pak Generator owners thousands of dollars every year in extra profits because of economical operation. These self-contained Steam-Pak Generators are designed for efficient steam production and to operate automatically in accordance with load demand. You get steam when you need it—and only when you need it. Steam-Pak Generators for high or low pressure steam or hot water range in size from 15 to 300 hp. and are fired with oil, gas, or either oil or gas.

$20,000 Saved—This spotless Steam-Pak installation at Stevens Linen Associates, Webster, Mass., saved boiler room space, fuel, and labor totalling approximately $20,000 annually.

GET YOUR COPY OF THIS MANUAL TODAY

"Steam is a Package"—a 14 page book which tells the installation and operating advantages of York-Shipley Steam-Pak Generators. Write today for your free copy of Bulletin 201.

YORK-SHIPLEY, INC.

Industrial Division, York, 7, Pa.

Automatic Heat & Power Specialists since 1918

These EVERLASTING advantages give better service from

Fig. 4001/6561. Duplex unit consisting of Straightway Lever-operated Sealing Valve and Angle Blowing Valve.

BOILER BLOW-OFF VALVES

When you install an EVERLASTING Duplex Blow-Off Unit, you'll find that its many superiorities speak for themselves.

The sealing valve at the left is the EVERLASTING design that has been famous for more than 40 years . . . the valve with the drop-tight seal that actually improves with use because of its self-lapping action each time the valve is opened or closed . . . the valve that can't stick or jam because of its non-wedge design . . . the valve that opens in less than a quarter turn to provide unimpeded straight-through blow.

The blowing valve at the right is the equally famous EVERLASTING Angle or "Y" Valve, specially designed and equipped to withstand repeated blow-off shocks, erosion and corrosion, and without pockets that might trap and hold solids.

Each of these valves . . . and all the other EVERLASTING Boiler Blow-Off valve types, fully meet ASME code requirements . . . assurance that they are properly designed and amply strong for the service.

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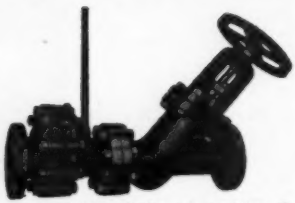

Fig. 4001/6571. Duplex unit consisting of Straightway Lever-operated Sealing Valve and Y Blowing Valve.

Fig. 4571/6561. Duplex unit consisting of Y Sealing Valve and Angle Blowing Valve.

Fig. 4561/4571. Duplex unit consisting of Angle Sealing Valve and Y Blowing Valve.

Everlasting Valves

TRADE MARK "EVERLASTING" REG. U.S. PAT. OFF.

FOR EVERLASTING PROTECTION

New bulletins and catalogs

(Continued from page 159)

Insulated Wiring **252**

Four page folder, "20 Questions and 20 Answers on Safety Mineral Insulated Wiring" describes and illustrates characteristics and advantages of this wiring system. Table of types, sizes, weights and lengths is included. General Cable Corp.

ELECTRICAL HEATING UNITS

Radiant Heaters **253**

Electric radiant heaters for use wherever heat is required for baking, drying, curing or dehydrating, are described in 6-page folder CS604. Units are in the far-infrared range. Advantages, design details and specifications are included. Typical applications are shown. Edwin L. Wiegand Co.

FILTERS, STRAINERS & PURIFIERS

Filters **254**

Replaceable cartridge filters for clarification of many fluids and gases are the subject of 4-page folder PJL-0351. Details of construction, operation and application are discussed, as well as specifications and tables of capacities and dimensions. The Cuno Engineering Co.

Twin Strainers **255**

Twin strainers for filtering foreign matter from oils, greases, tar, glue, sugar juice and similar viscous fluids are described in 4-page folder A-17. They are available with inlet sizes from 1 through 10 in. for working pressures to 300 psi. Elliott Co., Accessories Dept.

Pipeline Strainers **256**

Use of strainers reduces maintenance cost on such equipment as steam traps, reducing valves, air tools, pumps and temperature regulators, according to 4-page folder 252. Construction features and specifications for self-cleaning pipeline strainers from ¼ to 3 in. sizes are presented. The V. D. Anderson Co.

Duplex Strainers **257**

Design features and specifications for basket type duplex strainers are presented in 4-page folder 14-50. Inverted taper plug cock types are shown in sizes from ½ to 5 in. Disc valve strainers are shown for sizes over 5 in. Coen Co.

HEAT EXCHANGER EQUIPMENT

Cooling Towers **258**

Quick reference list of available literature on line of cooling towers and auxiliary equipment is contained in 4-page folder 1.19.092A. Types of cooling towers include mechanical draft, package type and atmospheric. Auxiliary equipment includes fans, fan drives and throats, louvers, and spray nozzles. Gas and air treating and heat exchanger equipment is also listed. J. F. Pritchard & Co.

HYDRAULIC EQUIPMENT

Solenoid Valves **259**

High pressure solenoid valves suited for all hydraulic systems handling non-corrosive fluids are the subject of illustrated booklet. Construction features and typical applications are presented. Waterman Engineering Co.

Hydraulic Unit **260**

Self-contained, heavy-duty hydraulic linear actuators for applications requiring constant and positive straight line push or pull, either horizontally or vertically, are the subject of 8-page bulletin 551. Specifications and features of the units are presented. Benjamin Lassman & Son.

Hydraulic Power Units **261**

Hydraulic units in single, double and combination pump types are described in catalog 400. Units are available with various tank sizes and capacities from .4 to 48 gpm at 1000 psi. Working drawings, specifications and engineering data are included. Rivett Lathe & Grinder, Inc.

INSTRUMENTS FOR MEASURE OF ELECTRICITY

Vacuum Tube Electrometer **262**

Descriptions of vacuum tube electrometers and accessories are presented in 8-page catalog. Application diagrams of 17 basic uses are given. Accessories include voltage dividers, static detector, electrometer shunt and test voltage supply unit. Keithley Instruments.

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MECHANICAL POWER TRANSMISSION

Overload Cut-Outs **263**

Cut-out pulleys and couplings which instantly shut off motors when an overload occurs are discussed in 12-page bulletin 51. Units reset automatically. Engineering information for proper selection is included. Torque range is 10 to 2000 in-lb for couplings and 20 to 10,000 in-lb for pulley type. John Waldron Corp.

Speed Reducers **264**

Fan-cooled speed reducers featuring a universal mounting arrangement are the subject of 28-page bulletin. Operating data, dimensions, typical installations and description of component parts are presented. National Transmission Products, Inc.

Leather Belting **265**

How leather belts are produced and tested is told in 40-page booklet 101. Leather belting described includes flat, flat-link, round, block-V, solid-V and laminated-V types. Also presented are lacings, dressings, cements and motor bases. Of particular value are chapters on required maintenance, how to make cemented laps, use of automatic clutches and use of motors and controls. Tables on horsepower ratings, belt speeds, how to find belt lengths, and motor data are also included. Graton & Knight Co.

Leather Belting **266**

Series of data sheets enclosed in filing folder describe leather products used by industry. Includes specifications for: flat and round belting in various grades for special purposes; packing for hydraulic and pneumatic equipment supplied as cup, flange, V and U leathers, as well as discs; and strapping including check, harness, jack, lug and holdup straps. Performance, advantages, how to order and recommended applications are given. Accessories such as a belting tool kit, belt clamps, stick dressing, cement, lace and fasteners are also presented. J. E. Rhoads & Sons.

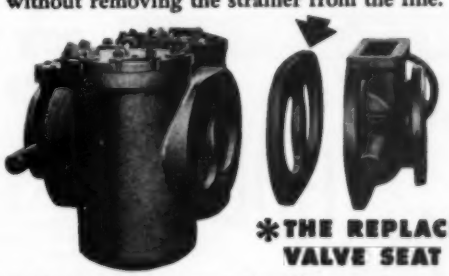
(Continued on page 163)

Why TWIN STRAINERS have exceptional life*

This shows the rubber ring inserted in a slot in the disc. Operating as a gate valve, the disc cleans its own seat before finally closing.

***THE REPLACEABLE DISC RING**

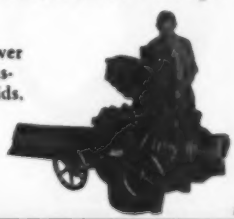
This is a Neoprene ring embedded in the face of the disc. It insures tightness and if after long use wear occurs, it can be inexpensively renewed. For this purpose the disc can be removed through the top of the strainer in a few minutes without removing the strainer from the line.



***THE REPLACEABLE VALVE SEAT**

Where liquids are exceptionally corrosive, a valve seat or "wear plate" can be supplied which can be replaced with a new wear plate when wear or pitting occurs. Not required under usual conditions, but just one more factor in adapting Twin Strainers to any service.

Many thousands of Twin Strainers in power plants, process plants, ships, and all industries needing non-stop clearing of liquids, have long demonstrated their sound qualities. Now redesigned for even better performance and lower operating cost. You will want the details — Bulletin A-13 on request.



A-310

ELLIOTT COMPANY

Accessories Dept., JEANNETTE, PA.

Plants in JEANNETTE, PA. • RIDGWAY, PA. AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.

PIONEERS are LEADERS

For nearly twenty years the makers of Winslow Filters have been pioneering the idea of giving engines and machinery better protection by keeping ALL your oil clean through the use of *Full-Flow* filtration. Along with pioneering the principle, these men have also held original patents on the successful application of that principle. You will profit by depending on the leadership that is enjoyed only by such pioneers.

WINSLOW FILTERS

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–for every industrial application!

POWER LINE FANS

● TYPE PLF POWER LINE DIRECT DRIVE — 16" to 48", all H.P. ratings. Square frames for easy mounting.

● TYPE PLDX POWER LINE DUCT BOOSTER — Motor external to air stream. 16" to 48", all H.P. ratings.

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● TYPE PLBD POWER LINE BELT DRIVEN — 24" to 48", all H.P. Square frames for easy mounting.

— solve your ventilation problems

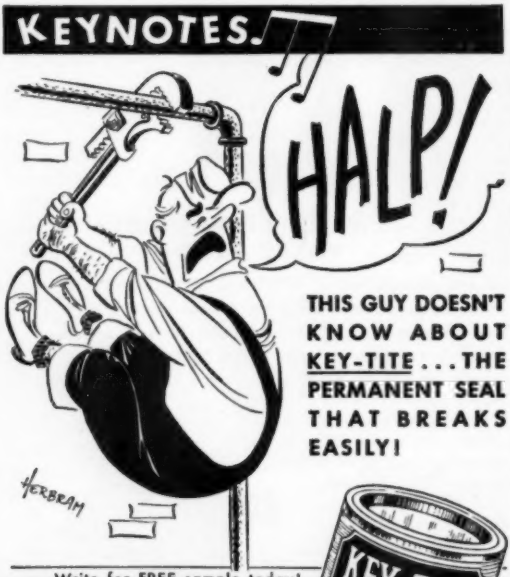
with CHELSEA'S new heavy duty airfoil type exhaust fans. For use in exhausting, duct work, filter installations, range or vat hoods, penthouse units, paint spray booths, where static pressure is encountered. All ratings are certified by P.F.M.A. test methods to insure proper performance.

Write for Catalog No. 460 address Dept. X-6.

CHELSEA FAN & BLOWER CO., Inc.

PLAINFIELD, NEW JERSEY

KEYNOTES.



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HOW YOU CAN MAKE PUMP REPAIRS EASIER

Worn seats and valve discs, broken springs and stems are eliminated with Sims Pump Valves. Sims valves cure frequent pump repair headaches with exclusive design features. They're **guaranteed** to give you better pump performance.

You get longer service from seats and discs because of rotating disc that changes to a new seating-surface every time it opens. Valves can't hammer up and down.

Inclined rib seat and shock-absorber stem heads combine to permit increased speed without valve-knock. Capacity can be increased 40% and more.

Low resistance through seat reduces turbulence — gives protection against vapor binding.

Long guide gives even lift — reduces wear. Spring is protected against jamming.

Write for new catalog showing how Sims valves fit your pump and give better pump performance.

SIMS PUMP VALVE CO., INC.

145 HUDSON ST., NEW YORK 13, N. Y. • M & M BLDG., HOUSTON, TEXAS

New bulletins and catalogs

(Continued from page 161)

Overload Clutches **267**

Overload release clutches are featured in 16-page bulletin ORC-52. Types described include: combination clutch and flexible coupling; reversible; with cutoff switch; automatic reset with cutoff switch; lateral rotating and stationary; and lateral with flexible coupling. Specifications are included. Overload Release Clutch Co., Inc.

Speed Reducers **268**

Description of double worm and helical-worm gear speed reducers are contained in 48-page bulletin G-WWH. Data are included on horsepower, output torque and center distances for reductions up to 6400:1. Information on how to select gearing, examples of selection, horsepower rating tables, dimension sheets and complete physical data add to the booklet's value. De Laval Turbine Co.

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V-Belt Drives **269**

V-drive selections can be made quickly and accurately with the aid of engineering guide 50-A. Formulas for standard quarter-turn and V-flat drives are augmented by tables of drives for all belt sections, compiled for quick selection of required ratio and speed. Also contains information on other types of V-belt drives. Fort Worth Steel & Machinery Co.

PACKINGS & GASKETS

Ring Packing **270**

Design features, operational data, installation procedures and suggested dimensions for G-T ring packing are contained in 8-page bulletin MP-68. Commercial applications to pressures of 15,000 psi are possible without extrusion of the packing, according to the booklet. Recommended uses include hydraulic and pneumatic cylinders and valves, welders, control units and testing equipment. Greene, Tweed & Co.

REFRACTORY CONCRETES

Boiler Refractories **271**

Application of monolithic refractory linings to firebox and similar types of heating boilers is discussed in 6-page bulletin 11. In addition to containing engineer's specifications for refractory linings and outside walls, typical installations are shown. Air-cooled as well as solid construction is dealt with. Plibrico Jointless Firebrick Co.

Boiler Settings **272**

Anyone concerned with boiler operation and maintenance should find helpful reference material in 24-page booklet entitled, "Boiler Settings with Plastic and Castable Refractories." Numerous drawings, charts, technical illustrations, applications and other data are presented. Refractory manufacture, design and installation are also described. Ramtite Co., Div. of The S. Obermayer Co.

(Continued on page 164)

"turn summer slack into PROFITABLE tube maintenance time with AIRETOOL!"
AIRETOOL forwardly swing arm cleaner is perfect for removing deposits from curved boiler tubes.
Ball bearing type expander with special construction features which reduce friction and produce smooth surfaces in small tubes.
Right angle gear drive for making expanding jobs easy in hard to reach places.

NOW is the time to order in the necessary AIRETOOL tube cleaners, expanders and accessory tools for summer maintenance jobs. Proper attention to the condition of pipe and tubes pays off in extra production and lower fuel costs.

AIRETOOL cleaners and expanders are designed to do your jobs quickly, safely and at low cost. Have a full "crew" on hand ready to go to work the next time you're "down." The AIRETOOL Mfg. Co., 318 S. Center Street., Springfield, Ohio, will send full details.

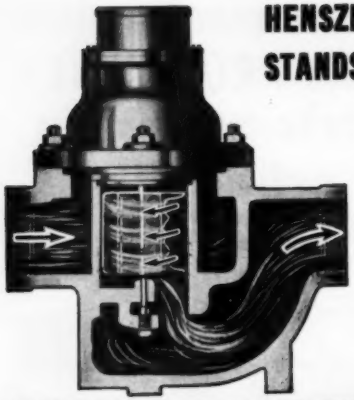
Just write, wire or phone.

AIRETOOL
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

There's an AIRETOOL Tube Cleaner and Tube Expander for Every Type of Tubular Construction.

BRANCH OFFICES: New York, Philadelphia, Chicago, Tulsa, Houston, Baton Rouge

Representatives in principal cities of U. S. A., Canada, Mexico, South America, England



HENSZEY *Feed Water* METER STANDS UP *where others* FAIL

The cutting, abrasive action of hot, dirty Boiler Blowdown quickly breaks down meters that depend upon close clearances and intricate parts for their accuracy. Henszey Meters stay accurate—stay on the job—accurately measuring Boiler Blowdown, Feed Water, Condensate, Free-Running Chemicals and other "hard-to-measure" liquids. For details consult Sweet's Catalog or write:

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FEED WATER METERS

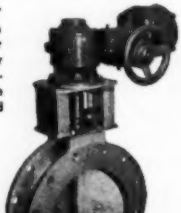
Continuous Blowdown • Distillation Systems • Heat Exchangers
Boiler Feed Regulators • Flow Indicators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

for Better Control and Shut-Off

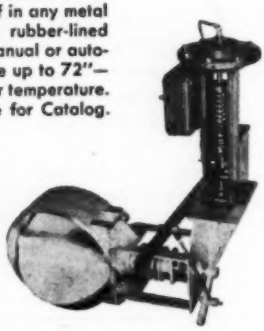
of Air • Gases • Liquids • Solids

Better choose Rockwell Butterfly or Slide Valves. You get commercially tight shut-off in any metal construction; drip or air-tight in rubber-lined metal valves. You can have any manual or automatic control mechanism. Pipe size up to 72"—and larger. High or low pressure or temperature. Easy to install and service. Write for Catalog.

"Kwikloen" slide valve with air cylinder operator; for handling carbon shapes in a hopper feed system.



Butterfly valve with electric motor and declutching mechanism for emergency handwheel operation; for handling water at 25 p.s.i.



Stainless steel butterfly valve for welding into pipe line; with air diaphragm operator and valve positioner; operation at 1600° F.

ROCKWELL VALVES

W. S. ROCKWELL CO. • 230 Eliot St., Fairfield, Conn.

New bulletins and catalogs

(Continued from page 163)

LUBRICANTS, LUBRICATION, OIL FILTERS & PURIFIERS

Centralized Lubrication **273**

"Studies in Centralized Lubrication," 8-page bulletin, describes and illustrates case histories of lubrication installations on various types of equipment. Advantages and performance are listed. The Farval Corp.

Lubrication Systems **274**

Positive mechanical method of delivering oil or grease under pressure from a centralized station is described in 16-page bulletin 25. How the valves operate and details of manual and automatic pumps are discussed. Advantages and typical installations are presented. Fittings and accessories are listed. The Farval Corp.

PACKAGED STEAM GENERATORS

Unit Steam Generator **275**

Design features of unit steam generators are discussed in 28-page booklet 2000. Illustrations supplement discussions. Data and dimensions of the units are listed. Capacities are listed from 690 to 20,700 lb steam per hr. Preferred Utilities Manufacturing Corp.

Package Steam Generators **276**

Construction of packaged steam generators is described in 8-page bulletin 1050. Auxiliary equipment is listed and a blueprint, with dimensions, of a typical boiler room layout is presented. Ames Iron Works.

Steam Generator **277**

Process steam generated at the point of use is possible with a forced recirculation steam generator, according to 12-page bulletin. Units are automatic and self-contained. Gas or oil may be used for fuel. Ratings from 25 to 100 hp are listed. Photos suggest possible applications. Clayton Manufacturing Co.

MOTORS & GENERATORS

Electrical Maintenance **278**

Electrical maintenance program based on use of genuine renewal parts, repair service plants, and engineering and field service is outlined in 24-page booklet B-4766. Available maintenance service for electrical apparatus is described. Westinghouse Electric Corp.

Progressive Mechanization **279**

Manual GEA-5769, 16-pages, is part of a new program in the More Power to America series. The program, "Progressive Mechanization," is aimed at boosting productivity by offering a step-by-step approach to problems of industrial mechanization. In addition to the manual, a 16-mm sound-color motion picture and survey form and check list make up the entire program. General Electric Co.

Motors & Generators 280

A-c generators, ringing power machines, d-c to a-c and a-c to d-c motor-generators, d-c to a-c rotary converters, high frequency generators and a-c power plants with gas engine drives are described in 4-page folder. Capacities are listed. Kato Engineering Co.

Induction Motors 281

Construction features of drip- and splash-proof squirrel cage induction motors are described in 6-page folder 51B7693. Units are from 15 hp at 450 rpm to 800 hp at 3600 rpm. Allis-Chalmers Manufacturing Co.

Gearmotors 282

Gearmotors comprising motor and speed reducer in a single housing are described in 8-page bulletin B-601. Numerous types of speed reducers and motors are offered. Motor ratings are from ½ to 75 hp. Speed ratios range from 2.5:1 to 97:1. Miehle Printing Press and Manufacturing Co., Star-Kimble Motor Div.

Motors 283

Illustrated 20-page catalog 174 contains information on variable speed drives, geared motors and constant normal speed motors in drip-proof, splash-proof, totally enclosed and pipe ventilated designs. Advantages, details of construction and specifications are included. Sterling Electric Motors, Inc.

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Variable Speed Motors 284

Typical applications for variable speed motors are illustrated in 8-page bulletin 1551. Speeds from 1 to 10,000 rpm are listed with motors from ¼ to 50 hp. U. S. Electrical Motors, Inc.

Induction Motors 285

Vertical induction motors, widely used for pumps and other vertical drives, are presented in 4-page folder 05B7629. Construction features for several types from 60 to 800 hp and larger are included. Allis-Chalmers Manufacturing Co.

Fhp Motors 286

General descriptions of characteristics, details of design and applications for completely redesigned series of fractional horsepower motors are contained in 4-color, 16-page booklet GEA-357. A quick reference illustrated chart shows the styles available for specific purposes. General Electric Co., Apparatus Dept.

PIPE & FITTINGS

Welding Fittings 287

Facts concerning welding fittings are briefly outlined in 16-page catalog 1051. Information on physical characteristics, assembly and how to order is also presented. Specifications are listed for various stainless steel lightweight welding fittings. Tri-Clover Machine Co.

Ball Joints 288

Flexible ball joints for application wherever moving pipes are encountered are described in 16-page catalog 215. Specifications and applications for several types are included. Photos depict actual installations. Service for steam pressures to 750 psi and hydraulic pressures from vacuum to 7500 psi are listed. Units will stand temperatures from -50 to 1000 F. Barco Mfg. Co.

(Continued on page 168)

"What Dust Collector is Designed expressly for small boilers from 100 to 2000 BHP?"

"The NEW BUELL 'LR' Fly Ash Collector"

. . . and it gets 99% of all 100 mesh and larger cinder discharge. What's more, draft loss with the 'LR' is so low that even the smallest natural draft boilers can use it effectively.

To learn how the new Buell 'LR' Dust Collector will help solve your Fly Ash problem, write today for the new 'LR' bulletin. Contact: Buell Engineering Company, Dept. 90-F, 70 Pine Street, New York 5, New York.

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Use **DURA HOOKS**

Rugged, flexible, hand-tools that "work around corners" for removing old packing from stuffing boxes. They SAVE TIME . . . put an end to fussing and cussing . . . improves your manpower efficiency. WRITE FOR DURA HOOK Bulletin DHPL covering SIZES and PRICES.

By the makers of Durametallic Locomotive Packings.

★ All Steel Flexible shaft

Tempered tool steel corkscrew bit

The PERFECT SEAL

DURAMETALLIC CORPORATION
KALAMAZOO MICHIGAN

New bulletins and catalogs

Continued from page 165)

Fusion Welded Steel Pipe **289**

Advantages, methods of manufacture and specifications for fusion welded steel pipe are discussed in 6-page folder. A variety of field joints and protective coatings are available to meet specific requirements. Pipe sizes from 4 to 36 in. are listed. Southern Pipe & Casing Co.

Swivel Joints **290**

Specifications for ball-bearing swivel joints are listed in 8-page catalog 51-C. Types and materials for specific applications are included. Chiksan Co.

SOOT BLOWERS & TUBE CLEANERS

Tube Cleaners **291**

Equipment for practically every tube cleaning operation is presented in 28-page catalog Y-29. Specifications for cutter heads, drills, brushes and motors are listed in illustrated tables for quick reference. Cutaways show design features of air, steam, water and electric powered motors. Applications of standard equipment as well as a few special applications are discussed. Accessories such as lubricators, valves, operating hose and couplings are also presented. Section on care and operation of tube cleaners and table of inside diameters for tubes and pipes add to the booklet's value. Elliott Co., Lagonda Div.

Tube Cleaners **292**

Air and water driven tube cleaners are described and illustrated in 4-page folder R 105. Heads and accessories also are included. Tables list models for straight and curved tubes. Elliott Co., Roto Div.

TOOLS

Hand Tools **293**

Wrenches and hand tools for industrial production and maintenance are presented in catalog 52-I. Drawings show each unit and tables list specifications. Pulling equipment is also listed. Useful table lists all wrench openings for standard bolts and nuts. Snap-On Tools Corp.

TRANSFORMERS

Variable Transformer **294**

Featured in 4-page folder P252 is a variable transformer designed for a-c voltage control applications involving 50, 100 and 150 w. Application, advantages and specifications are presented. Table lists other products including voltage regulators, power supply units, binding posts and dimmers. The Superior Electric Co.

Dry Type Transformers **295**

Ratings of 600 v and below, single phase, 3 to 200 kva are listed for dry type transformers featured in 4-page folder 6-01. Advantages and construction details are discussed, and table lists specifications. Magnatran Inc.

VALVES

Gages & Valves **296**

Heated and cooled gages and valves built to meet special conditions are described in 4-page folder 179. Gages include internal and external models. Specifications and dimensions also are presented. Jerguson Gage & Valve Co.

Valves **297**

"Valves of Iron," 4-page folder V-405, lists general specifications for standard iron gate, globe and check valves. UL approved valves for fire line use and gate valves conforming to specifications of American Water Works Assoc. also are listed. Cutaway views show use of bronze in these valves. The Fairbanks Co.

Corrosion Resistant Valves **298**

Types, sizes, operation and features of corrosion resistant valves are described in 36-page bulletin V-217. Reference is also made to multiport, steam jacketed and power operated valves and their applications to process industries. Tables list approximately 175 chemicals and the alloy valves and lubricants recommended for each. Other sections are devoted to lubricants and lubricant equipment, heavy-duty instrument and gage valves, remote registration, industrial meters and water meters. Rockwell Manufacturing Co.

Cushioned Valves **299**

Cushioned water and steam valves designed for smooth operation to prevent shock, hammer or chattering are described in 8-page bulletin G-3. Valve types include float, reducing, relief and non-return. Golden-Anderson Valve Specialty Co.

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STEAM SPECIALTIES

Steam Traps **300**

Steam traps equipped with bronze, monel, or stainless steel bellows and body construction of bronze, semisteel or cast iron are featured in 12-page catalog 152. Sizes are ¼ to 2 in. for all pressures from vacuum to 300 psi. In addition to capacity tables and dimensions, recommended piping diagrams, typical applications and data concerning selection of units are included. W. H. Nicholson & Co.

Water Heaters **301**

Catalog 202, 40 pages, provides a simple, quick means of selecting the correct water heater for forced circulation. Capacities are from 95 to 101,000 gph. Steam pressures are from 0 to 100 psig and water temperatures range from 40 to 100 F inlet, and 80 to 300 F outlet. Booklet, using index tabs for quick reference, includes many useful tables. Patterson-Kelley Co.

Steam Traps **302**

"Installation and Maintenance of Traps," 8-page bulletin 1722, should be a valuable addition to your engineering file. Suggestions for proper installation of steam traps are discussed. Other chapters deal with trouble shooting, maintenance program and lists of traps and repair parts. Armstrong Machine Works.

TANKS

Floating Roof Tanks **303**

Double-deck floating roof tanks, especially suitable for storage of crudes where corrosion is a factor, are presented in a 12-page bulletin. Operating features are described. Photos depict many actual installations. Graph giving calculation of average standing losses is included. Graver Tank & Mfg. Co., Inc.

(Continued on page 168)

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New bulletins and catalogs

(Continued from page 167)

PUMPS

Centrifugal Pump **304**

Sectional view of a two stage centrifugal pump points out details of construction in 4-page folder 246. Specifications are discussed, and tables list ratings and dimensions. Warren Steam Pump Co., Inc.

Chemical Feed Pump **305**

Low capacity pumps for maintenance-free feeding of corrosive solutions are described in 8-page bulletin 1923. Maximum capacity is 2 cc per stroke against pressures up to 50 psig. Two models, a solenoid actuated electrical unit and a diaphragm actuated hydraulic unit, are offered. Typical applications, dimensional drawings, design details and advantages are presented. % Proportioneers, Inc. %.

Centrifugal Pumps **306**

Two instruction booklets covering the installation, operation and repair of centrifugal pumps are offered. Bulletin O8X7813, 28 pages, is for single-stage, single-suction units, while bulletin O8X7780, 52 pages, is for multi-stage pumps. Included are valuable maintenance timetables and a chapter on how to locate and correct trouble. Cutaway and cross-section views illustrate construction features of various types. Allis-Chalmers Manufacturing Co.

Process Pumps **307**

Chemical process pumps for pumping liquids, hot or cold, in capacities up to 1500 gpm and heads up to 231 ft are presented in 8-page bulletin B-1600. Design features, characteristics and dimension tables are included. Food Machinery and Chemical Corp., Peerless Pump Div.

Turbine Vane Pumps **308**

Self-priming, turbine vane pumps for hot and cold, clear and vaporous liquid, in moderate capacities against medium or high heads, are featured in 12-page bulletin B-2205. Descriptions together with head-capacity charts, sectional views and elevation drawings and dimensions are included. Food Machinery and Chemical Corp., Peerless Pump Div.

WATER TREATMENT

Deaerating Heaters **309**

Tray and spray-tray type deaerating heaters are the subject of 12-page bulletin WC-106. Introductory section explains principles of successful deaeration and essential elements of deaerating heaters. Features are listed in tabular form and

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illustrated by drawings. Included are flow diagrams and photos of typical installations. Graver Water Conditioning Co.

Zeolite Softener **310**

Bulletin 4520-A contains explanation of zeolite water softening, including glossary of terms, data for laying out softening plant, factors governing equipment size, selection of zeolites, and description of operating stages of a sodium zeolite softener. Description of single control valve featuring six valves in one also is included. Cochrane Corp.

Vacuum Deaerator **311**

How a vacuum deaerator removes oxygen and free carbon dioxide from water is described in 8-page bulletin 3008. Construction details and uses for the units are presented. Also described is a degasifier unit. The Permutit Co.

Water Conditioning **312**

General description and comparisons of numerous water treatment processes are presented in illustrated 16-page booklet. Chapters are divided into treatment for suspended impurities and dissolved impurities, including de-ionization. Industrial applications for many industries are listed. Paddock Engineering Co. of California.

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Mixed Bed Demineralizer **313**

System consisting of a single ion exchange unit containing a homogeneous mixture of cation an anion exchanger is described in 4-page folder. Advantages and applications are outlined. The Permutit Co.

MISCELLANEOUS

Industrial Waste Treatment **314**

Equipment for water, sewage and industrial waste treatment is described in 52-page catalog 833. Included are screens, grinders, dewatering conveyers, grit collectors and washers, biofiltration systems, settling tanks, scum removers and chemical feeders. Typical installations are illustrated. The Jeffrey Manufacturing Co.

Cleaning Service **315**

Service described in 8-page bulletin offers efficient cleaning for surfaces of steam generators, heat exchange equipment, water lines and well piping, without dismantling and with minimum downtime. How the service works and photos of personnel and equipment in operation are presented. Dowell Inc.

Wired Television **316**

Advantages of wired television in industry are discussed in 4-page folder 1025-A. Typical uses are listed, and technical information concerning camera tube is presented. Circuit design for camera, power unit and monitor are also discussed. Diamond Power Specialty Corp.

Foundry Mechanization **317**

How a foundry can be mechanized for increased production, better castings and improved working conditions is the topic of 34-page booklet 2439. Selection of actual case histories, foundry layout drawings and installation photos are presented. Link-Belt Co.

(Continued on page 171)

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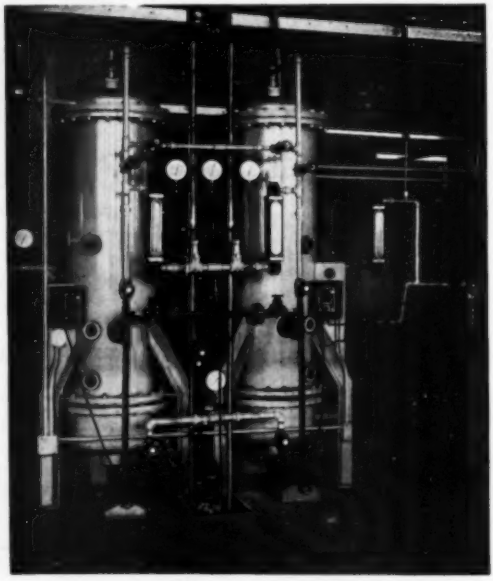

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The Valve World

In general, Crane's publication is devoted to development and application of industrial piping materials. Vol. XLIX, No. 1, presents seven diversified articles on industrial valves and fittings. Data sheets, charts on "how to select," and other piping information are usually included in the 32- page publication. Crane Co., Sales Div. 836 S. Michigan Ave., Chicago 5, Ill.

Fusion Point

Theme of this quarterly house organ is the importance of coal in our national economy, and the necessity of intelligent application of the right coal to specific types of burners. Featured in the March issue is a well-illustrated article on a typical coal burning cement mill. Printed in two colors and contains 32 pages. Southern Coal Co., Inc., Advertising Dept., 333 N. Michigan Ave., Chicago 1, Ill.

Power Notes

Published primarily for steam, mechanical and consulting engineers. Reprints articles selected from various sources. Usually are helpful articles dealing with steam engineering for both high and low horsepower. Vol XXXIX, No. 1, a typical issue, contains such articles as "Reduction of Deposits on Gas-Swept Surfaces in Steam Generators," "Power Field," and "Effectiveness of Fire Tube Inserts." Diagrams, curves and sketches are used to illustrate the 8-page issue. Diamond Power Specialty Corp., Lancaster, Ohio.

Inco Magazine

Service records of nickel and nickel alloys for many different applications are outlined in the articles published in Inco Magazine. Vol. 25, No. 2, contains 16 articles on such varied subjects as escape wheels in watches, a new heat-resistant alloy, continuous annealing system, and ways to squeeze the most out of the strategic materials. 32 pages. The International Nickel Co., Inc., 67 Wall St., New York 5, N.Y.

Alco Products Review

Dissemination of design and installation information on heat exchangers, pressure vessels and piping is the main objective of this new house organ. Vol. 1, No. 2, 20 pages, includes well-illustrated articles on ring expansion joints for heat exchangers, evaporator installation, air coolers that handle four cooling duties, along with Part 1 of "Venting of Feedwater Heaters and Evaporators." American Locomotive Co., Public Relations Dept., Schenectady 5, N. Y.

Thermogram

Usually carries case histories showing applications of the R & I line of refractory and insulating materials. Vol. X lists installations of the various products. On-the-job photographs illustrate the 4-page folder. Refractory & Insulation Corp., 120 Wall St., New York 5, N. Y.

Copper & Brass Bulletin

Published quarterly to provide interesting and timely information about copper and copper-base alloy mill products. The May issue portrays the copper situation throughout the world and presents the interesting story of the copper industry's expansion program to alleviate the temporary shortage. Copper & Brass Research Association, 420 Lexington Ave., New York 17, N. Y.

—End

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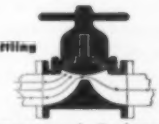
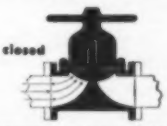


Compressor and diaphragm partially lowered. Compressor design guides and supports diaphragm.



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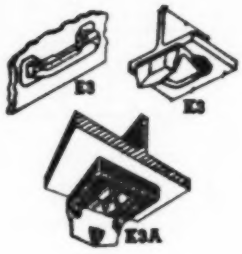

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"Quaker Designs Plant for Ease of Operation", March 1952

"Practical Considerations in Applying Axial-Flow and Mixed-Flow Pumps", Sept. 1951

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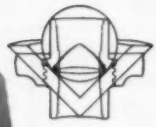

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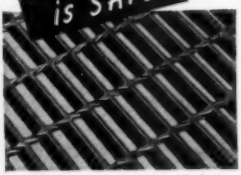

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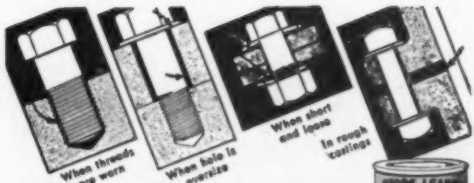

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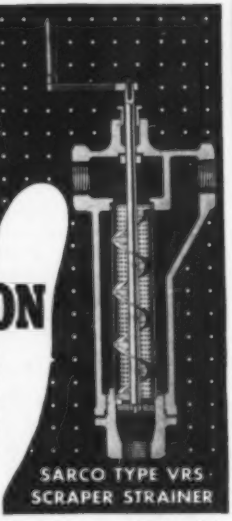

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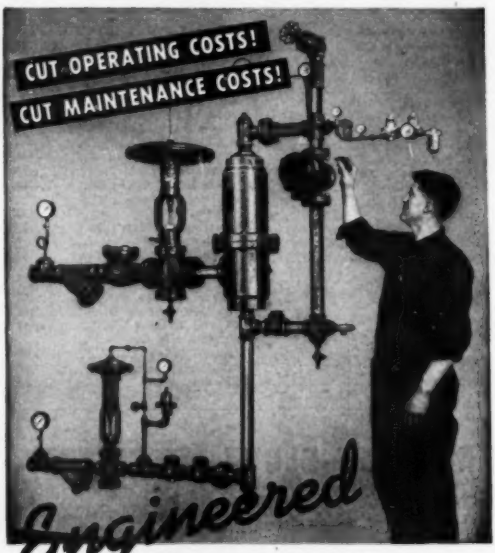

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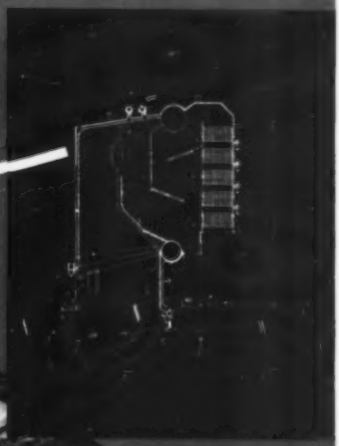
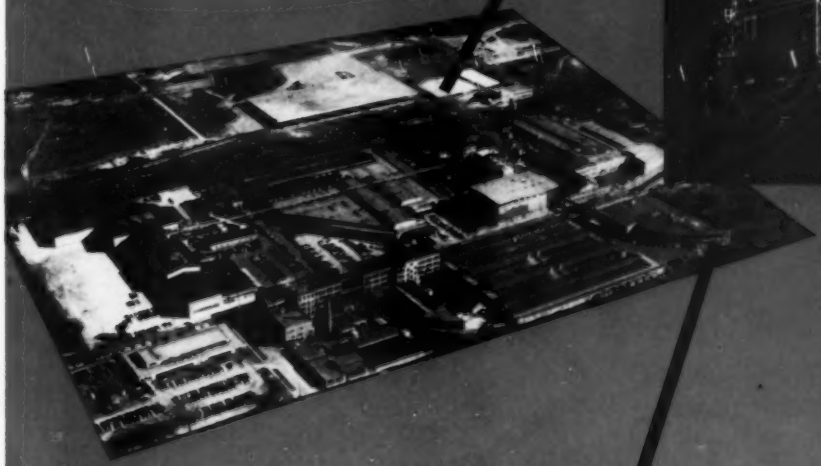
SUTHERLAND PAPER COMPANY Installs 12th WICKES STEAM GENERATOR





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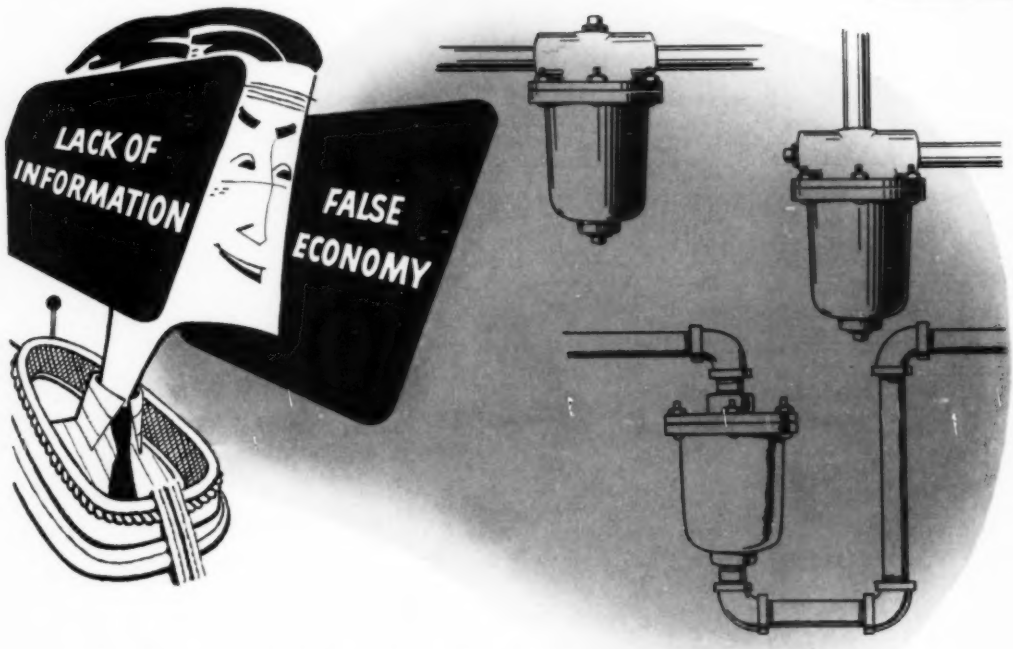

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